TETRA TECH

3 February 2023

Mr. Joshua Barber
On-Scene Coordinator
U.S. Environmental Protection Agency, Region 3
1600 John F. Kennedy Boulevard
Philadelphia, Pennsylvania 19103

Subject: **Final Engineering Evaluation / Cost Analysis**
Groundwater Treatment
Havertown PCP Site
EPA Contract No. 68-HE-0320-D0003
Technical Direction (TD) No. T605-21-07-001
Document Control No. 0572

Dear Mr. Barber:

Tetra Tech, Inc. (Tetra Tech) is submitting the enclosed Engineering Evaluation / Cost Analysis (EE/CA), Revision 1, for your review and approval. This EE/CA presents the alternatives for groundwater treatment of pentachlorophenol (PCP) at the Havertown PCP Site.

If you have any questions regarding this EE/CA, please call me at (907) 227-6683.

Sincerely,

Shelley A. McCoy, P.E.
TD Project Manager / Project Engineer

Enclosures (1)

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FINAL ENGINEERING EVALUATION / COST ANALYSIS

NON-TIME-CRITICAL REMOVAL ACTION (GROUNDWATER TREATMENT)

HAVERTOWN PCP SITE
HAVERFORD TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA

EPA CONTRACT NO. 68-HE-0320-D0003
TECHNICAL DIRECTION NO. T605-21-07-001
DOCUMENT TRACKING NO. 0572

Prepared For:

U.S. Environmental Protection Agency Region 3
Superfund and Emergency Management Division
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Tetra Tech START – TD Project Manager – Shelley McCoy, PE (AK, MD, DE, PA, NY, NJ, MT)	02/03/2023 Date
Tetra Tech START – Quality Assurance Officer –	02/02/23 Date
EPA – Remedial Project Manager – Joshua Barber JOSHUA BARBER Digitally signed by JOSHUA BARBER Date: 2023.02.03 14:10:06 -05'00'	Date

CONTENTS

Appendices

LIST OF ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per liter
ARARs	Applicable or Relevant and Appropriate Requirements
BaP	benzo(a)pyrene
bgs	below ground surface
CFR	*Code of Federal Regulations*
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	contaminants of concern
DNAPL	dense non-aqueous phase liquid
EE/CA	engineering evaluation / cost analysis
EPA	U.S. Environmental Protection Agency
FS	feasibility study
gpm	gallons per minute
GWTP	groundwater treatment plant
HI	hazard index
LNAPL	light non-aqueous phase liquid
LTM	long-term monitoring
MCL	Maximum Contaminant Levels
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NTCRA	Non-time-critical removal action
NWP	National Wood Preservers
O&M	operation and maintenance
OSRTI	EPA Office of Superfund Remediation and Technology Innovation
OU	Operable Unit
OWS	oil-water separator
PADEP	Pennsylvania Department of Environmental Protection
PADER	Pennsylvania Department of Environmental Resources
PAH	polycyclic aromatic hydrocarbon
PCG	Philadelphia Chewing Gum Company
PCP	pentachlorophenol
ppb	parts per billion by mass
PTW	principal threat waste
RAO	Removal Action Objective
RGO	Remedial Goal Objective
RI	remedial investigation
RML	Removal Management Levels
ROD	Record of Decision
ROS	Recreational Open Space (Haverford Township owned)
RSE	removal site evaluation

LIST OF ACRONYMS AND ABBREVIATIONS

SLERA	screening level ecological risk assessment
SVOC	Semivolatile organic compound
TBC	Advisories, criteria, or guidance "to be considered" for a particular release.
TCE	trichloroethylene
TCRA	time-critical removal action
TGTS	Temporary Groundwater Treatment System
U.S.C.	U.S. Code
USDA	U.S. Department of Agriculture
VOC	volatile organic compound

1.0 INTRODUCTION

This engineering evaluation/cost analysis (EE/CA) is for a non-time-critical removal action (NTCRA) at the Havertown PCP Site (Site), in Haverford Township, Delaware County, Pennsylvania (Figure 1). This EE/CA includes an analysis of removal action alternatives to treat groundwater impacted by hazardous substances, including pentachlorophenol (PCP), petroleum-related volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs) including benzene, ethylbenzene, toluene, xylene, polycyclic aromatic hydrocarbons (PAHs), and dioxins/furans. The desired remedy will discharge treated groundwater to surface water. This EE/CA was conducted because two of the eight factors outlined in Section 300.415(b)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) are applicable to conditions at the Site:

> (i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants, 40 Code of Federal Regulations (C.F.R.) § 300.415(b)(2)(i);
>
> (ii) High levels of hazardous substances or pollutants or contaminants in soils, largely at or near the surface that may migrate, 40 C.F.R. § 300.415(b)(2)(iv).

The NTCRA will be conducted in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA), 42 U.S. Code (U.S.C.) §§ 9601-9675, and the NCP, 40 C.F.R. Part 300. Preparation of this EE/CA and implementation of the NTCRA will also be informed by the Environmental Protection Agency (EPA) guidance, *Conducting Non-Time Critical Removal Actions under CERCLA*, August 1993 (EPA 1993) ("NTCRA Guidance").

1.1 Purpose of EE/CA

This EE/CA was developed to analyze removal alternatives for an NTCRA for Operable Unit 3 (OU3) – Deep Groundwater, at the Site. EPA defines a NTCRA as a removal action for which a planning period of a least 6 months exists before on-site activities must be initiated. As provided by Section 300.415(b)(4)(i) of the NCP,[1] EPA, as lead agency, must conduct an EE/CA for a NTCRA. The goal of this EE/CA is to identify the objectives of the removal action; identify alternatives that may be used to meet these objectives; and analyze these alternatives for cost, effectiveness, and implementability. EPA's removal action objectives for the Site are:

1. Install and operate a new groundwater treatment system to contain the groundwater contamination plume in the shallow and deep aquifers to: (1) prevent further migration of the

[1] 40 C.F.R. § 300.415(b)(4)(i).

plume and the discharge of contaminants of concern (COCs) to surface water bodies, and (2) ensure that groundwater downgradient of the Site is not impacted by COCs;

2. Contribute to the long-term treatment of on-site groundwater to achieve Remedial Goal Objectives (RGOs) established in the OU3 Record of Decision (ROD) and discharge treated groundwater to surface water in concentrations that meet substantive limits established under the National Pollutant Discharge Elimination System (NPDES); and

3. Contribute to the long-term restoration of on-site groundwater for beneficial use, to the extent practicable.

1.2 EE/CA Organization

This report has been organized into the following sections:

- Section 2 - Site Characterization: provides a description of the Site and background information including Site history; previous work at the Site; and a summary of the conceptual site model and results of the streamlined risk evaluation.

- Section 3 - Identification of Removal Action Objectives (RAOs): includes identification of the RAOs for the Site, applicable or relevant and appropriate requirements (ARARs), statutory limits on the removal action, and determination of removal scope and schedule.

- Section 4 - Identification and Analysis of Removal Action Alternatives: includes the evaluation of effectiveness, implementability, and alternative costs.

- Section 5 - Comparative Analysis of Removal Action Alternatives: compares the alternatives using NTCRA criteria.

- Section 6 - Recommended Removal Action Alternative: provides the rationale and recommended removal action alternative.

- Section 7 - References: To streamline this report, information from past site investigations and actions is integrated into this report; Section 7 lists the references used to develop this EE/CA.

Appendices to the EE/CA provide the following supporting information: (1) supporting information and data from the field investigation (Appendices A and B); (2) ARARs (Appendix C); and (3) cost estimates for the removal action alternatives (Appendix D).

EPA will make this EE/CA and the EE/CA administrative record available for public review and comment and will also publish a notice informing the public of EPA's preferred removal alternative. Following a 30-day public comment period and consideration of any significant comments submitted by the public, EPA will issue an Action Memorandum selecting a NTCRA for OU3. EPA will then implement the NTCRA. EPA has consulted, and will continue to consult, with the Pennsylvania Department of Environmental Protection (PADEP), which is the support agency at the Site.

1.3 Overview of the EE/CA Process in Conducting Non-Time-Critical Removal Actions

1.3.1 Applicable Regulatory Requirements

This EE/CA has been prepared pursuant to the requirements for NTCRAs under Section 300.415 of the NCP. The goals of this EE/CA are to identify RAOs for the NTCRA and to analyze removal action alternatives that would achieve these RAOs. Section 300.820(a) of the NCP[2] requires that, upon completion of the EE/CA and identification of the preferred removal action alternative, a minimum 30-day public comment period must be held to solicit public comments on the preferred alternative. These comments and responses to significant comments will be included in the administrative record file for the Action Memorandum selecting the NTCRA.

After EPA has addressed any significant public comments and any comments submitted by federal, state, and local regulatory agencies, EPA will prepare an Action Memorandum. The Action Memorandum will not be prepared as part of the EE/CA but will be a separate document that (1) evaluates whether the release or threatened release of a hazardous substance, pollutant, or contaminant at the Site meets statutory and NCP requirements for a removal action and (2) selects a removal action for the Site. The findings and results of this EE/CA will be summarized by EPA in the Action Memorandum. Responses to significant public comments on this EE/CA will also be discussed in the Action Memorandum and as mentioned above, become part of the associated administrative record file. EPA will design and implement the removal action that is selected and documented in the Action Memorandum.

Under CERCLA Section 121(e)(1)[3] and Section 300.400(e) of the NCP, no federal, state, or local permits are required for *on-site* response actions conducted pursuant to CERCLA Section 104[4]. The term *on-site* means the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action. Removal actions conducted under CERCLA must attain ARARs to the extent practicable, considering the exigencies of the situation. In determining whether compliance with ARARs is practicable, the lead agency may consider appropriate factors, including (1) the urgency of the situation, and (2) the scope of the removal action to be conducted.[5]

[2] 40 CFR § 300.820(a).
[3] 42 U.S.C. § 9621(e)(1).
[4] 42 U.S.C. § 9604 and 40 C.F.R. § 300.400(e).
[5] 40 CFR § 300.415(j).

1.3.2 Definition of Removal Actions

CERCLA and the NCP have defined removal actions to include: (1) the cleanup or removal of released hazardous substances from the environment; (2) such actions as may be necessary in the event of the threat of release of hazardous substances into the environment; (3) actions that may be necessary to monitor, assess, and evaluate the release or threat of release of such hazardous substances; (4) the environmentally sound disposal of any removed material; or (5) the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment that may otherwise result from a release or threat of release.[6] EPA has categorized removal actions as emergency actions, time-critical actions, or non-time-critical actions, based on (1) the type of situation, the urgency, and threat of the release or potential release, and (2) the timeframe in which the action must be initiated.

NTCRAs may be interim (that is, they may be one of a series of planned response actions) or final. When a NTCRA is the first and only action expected, and where no other data is available, the EE/CA should provide definitive information on the source, nature, and extent of contamination, and risks presented at the site. In contrast to the situation where only a single removal action is taken, the NTCRA can also be one of a series of response actions (interim actions), where a completed remedial investigation (RI) is or will become available, and where the nature and extent of contamination and the risk presented by the site have been, or will be, determined.

Under such a situation, the EE/CA is similar to a Focused Feasibility Study (FFS), concentrating on the analysis of several appropriate alternatives and providing reference to existing information on the nature and extent of the contamination and risks. In the case of the Havertown PCP Site, multiple previous remedial and removal actions have been implemented to address different areas impacted by the Site contamination, and substantial Site information and documentation already exists. This EE/CA is being used to: (1) develop and evaluate NTCRA alternatives for OU3 (groundwater), and (2) recommend a preferred removal action alternative to address the collection and treatment of groundwater at the Site.

This EE/CA has been developed as a stand-alone report to document the basis for the NTCRA for OU3 and the selection of the preferred removal action alternative. To streamline the report, this EE/CA relies upon and cites existing documentation; Section

[6] 42 U.S.C. § 9601(23); 40 C.F.R. § 300.5.

2.0 SITE CHARACTERIZATION

2.1 Site Description and Background

The Site is in the Havertown section of Haverford Township, Delaware County, in southeastern Pennsylvania, approximately 10 miles west of Philadelphia (Figure 1). Commercial establishments, industries, parks, schools, and residential homes surround the site.

The Site covers approximately 12 to 15 acres but has no distinct boundaries and includes the areal extent of a plume of contamination in groundwater. The Site is roughly delineated by the former Penn Central Railroad (PCRR) tracks to the north, Naylor's Run (a creek that drains the area) to the east, Lawrence Road and Rittenhouse Circle to the south, and the Continental Motors property to the west.

Historically, the sources of Site contamination originated from the National Wood Preservers (NWP) wood-treatment facility and the Philadelphia Chewing Gum Company (PCG) manufacturing plant. In 1962, the Pennsylvania State Department of Health was able to attribute contaminants in Naylor's Run to NWP's waste disposal practices.

From approximately 1947 to 1963, the NWP property was used to treat wood products using PCP dissolved in diesel fuel. NWP allegedly disposed of waste materials into a well reportedly in the vicinity of the former Young's Produce Market, at the corner of Lawrence and Eagle Road. However, the exact location of the well was not identified. In 1977, the NWP facility discontinued the use of PCP and fuel to treat wood products and began treating wood using metal salts.

Potable water in the vicinity of the Site is provided by AQUA America, Inc., a water and wastewater utility company, which obtains water from Pickering Creek Reservoir, Perkiomen Creek, and from the Schuylkill River, for use in Haverford Township. Currently, there are no known private groundwater drinking wells in Havertown.

The primary COCs at the Site are PCP, petroleum-related VOCs and SVOCs, including benzene, ethylbenzene, toluene, xylene, PAHs, and dioxins/furans.

The Site was placed on the National Priorities List (NPL)[7] in 1982. The Site is currently divided into three OUs. OU1 includes the discharge of contaminated groundwater to Naylor's Run and the on-site wastes at

[7] The NPL is a list of national priorities among the known or threatened releases of hazardous substances, pollutants or contaminants throughout the United States. The NPL is appendix B of the NCP and is required under Section 105(a)(8)(B) of CERCLA, 42 U.S.C. § 9605(a)(8)(B).

the NWP facility. OU2 includes shallow groundwater. OU3 includes deep groundwater in the Source Area and the groundwater and soil contamination in the Recreation Open Space (ROS) area of the Site, which is located between the terminal ends of Harrington Road and Washington Avenue.

2.2 Previous Response Actions

In 1972, the Pennsylvania Department of Environmental Resources (PADER[8]) identified contaminated groundwater that entered Naylor's Run. In 1976, EPA performed containment operations after a request from PADER. EPA formally added the Site to the NPL in 1982. Between 1982 and 1984, PADER and EPA found that the previously implemented containment operations were deficient. EPA then issued a unilateral administrative order to NWP requiring NWP to perform abatement activities at the Site. Between 1987 and 1989, PADER performed an RI/FS for OU1.

EPA issued the first Record of Decision (ROD) in 1989 for OU1 (1989 ROD). The 1989 ROD selected the Superfund-lead interim remedy, under which EPA installed an oil-water separator (OWS) catch basin in Naylor's Run and arranged for the off-site disposal of wastes that had accumulated on-site.

A Superfund-lead NTCRA was implemented by EPA from 1996 to 1997 as part of an ongoing RI/FS. The NTCRA included installation of a synthetic geomembrane cap was installed over 3 acres of the Site that had historically been used for NWP operations. This cap prevents potential exposure associated with direct contact with contaminated soils and the potential transport of Site contaminants from precipitation runoff and infiltration.

The second ROD was issued in 1991 (1991 ROD) and was also a Superfund-lead interim remedy implemented to address contaminated shallow groundwater (referred to as OU2) through (1) the installation of free-product recovery wells on the NWP property and a groundwater collection trench to intercept the contaminant plume; (2) rehabilitation of the leaking storm sewer; and (3) construction of a groundwater treatment plant (GWTP) adjacent to the NWP property.

The third ROD for the Site in 2008 (2008 ROD) was the final remedy for the Site and addressed OU3A and OU3B. OU3A is defined as the contamination in the deep groundwater in the source area; OU3B is the Haverford Township Recreation Open Space (ROS) area located east of Rittenhouse Circle. Contaminated groundwater from the Source Area has been transported to the ROS area via an abandoned sanitary sewer line that had not been closed adequately. The 2008 ROD incorporated the OU2 interim remedy and addressed deep groundwater by (1) installing additional groundwater recovery wells, (2) increasing the

[8] PADER is now referred to as PADEP (Pennsylvania Department of Environmental Protection).

capacity of the GWTP, (3) excavating and disposing of contaminated soil off-site, and (4) installing shallow recovery wells from a secondary source area that was created by an abandoned underground pipe that conveyed Site contaminants.

In January 2019, EPA and PADEP (formerly PADER) responded to a resident who lives in an area that straddles the contaminated groundwater plume at the Site along Rittenhouse Circle in Havertown ("the affected property"). The resident reported water with an oily sheen seeping from the ground surface in the resident's backyard, and a large volume of water seeping into the crawlspace beneath the house. Excessive precipitation had occurred in the area throughout 2018. During an inspection of the affected property and adjacent properties, EPA and PADEP observed saturated surface soil, water seepage, and surface-water drainage-flow paths across multiple residential properties. Several other residential properties were also experiencing water seepage in their basements and crawlspaces at substantially increased rates.

Subsequent rounds of sampling by PADEP and EPA during a Removal Site Evaluation (RSE) identified multiple Site COCs in crawlspace sump water. In addition, backyard seep water showed multiple COCs above the OU3 2008 ROD groundwater and/or soil RGOs and/or EPA Removal Management Levels (RMLs), including the following media and COC exceedances: PCP (soil), benzo(a)pyrene (BaP) (soil and seep water), and total dioxin (soil).

In September 2019, EPA initiated a TCRA that was selected in a September 2019 Action Memorandum (2019 Action Memo). The TCRA included: (1) excavation and off-site disposal of contaminated soil from impacted residential areas having COCs above RGOs or RMLs, or exceeding unacceptable risk criteria based on RSE sampling results (Residential Area of the Site); (2) interior and exterior modifications to residential structures at the Site to prevent or minimize contaminated groundwater from entering these structures; (3) implementation of additional groundwater capture-and-extraction points for portions of the plume that posed a threat of release to Residential Area of the Site; (4) additional lining and repair of a stormwater pipe to prevent COCs from entering the pipe and discharging to Naylor's Run; and (5) additional soil and groundwater sampling and confirmation sampling to fill RSE data gaps.

In September 2020, EPA issued an Action Memorandum (2020 Action Memo) that expanded the scope of the TCRA to include modifications to the GWTP to accommodate increased volumes of groundwater caused by the response actions taken under the TCRA. Under the 2020 Action Memo, EPA (1) installed two new, large groundwater collection trenches with sumps, vaults, and connections in the Residential Area of the Site; (2) established a Temporary Groundwater Treatment System (TGTS) for use during GWTP modification; and (3) initiated dismantling of the GWTP to prepare for its expansion.

In August 2021, EPA issued an Action Memorandum (2021 Action Memo) to increase the project cost ceiling from approximately $8.1M to $12.5M. As described in the 2021 Action Memo, EPA (1) assembled and started operation of the TGTS and (2) completed the dismantling of the GWTP (including a compromised building that could not safely be rehabilitated). The original plan of expanding the existing GWTP could not be safely implemented because of degraded building structure conditions. This necessitated the demolition of the entire GWTP.

In August 2022, EPA issued an Action Memorandum (2022 Action Memo) to increase the project ceiling to $15.1M and change/clarify the scope of the Removal Action to include: (1) arrange for the installation of a solid foundation for the future expanded and upgraded new GWTP; (2) clarify the use of the TGTS while the original GWTP was being modified/repaired; and (3) remove and dispose of the entire above-grade portion of the existing GWTP to protect the safety of on-site workers.

All construction activities in the Residential Area of the Site are completed, and the residential systems are operating as intended. The TGTS is being operated under the TCRA by the Region 3 Removal Program and is treating approximately 75 gallons per minute (gpm) of collected contaminated groundwater. This treatment rate is approximately 10 to 20 gpm greater than that of the old GWTP (55 to 65 gpm).

Under a Superfund State Contract, PADEP continues to conduct long-term monitoring (LTM) of the Site groundwater and surface water and to perform maintenance on the original groundwater recovery wells.

2.3 Site Geology and Hydrogeology

2.3.1 Surface Water Hydrology

The Site is drained by Naylor's Run, an intermittent stream that runs through most of the Site and flows in a southeasterly direction. Perennial flow normally begins at the township ROS area, and at this same area, Naylor's Run receives flow from two unnamed tributary streams. Additionally, some flow enters Naylor's Run from drains installed in yards along the stream. Residents near the collection trench have installed lawn drains leading to Naylor's Run. Active seepage from these drains into Naylor's Run is occasionally visible.

Much of the area near the Site is impervious, including the capped site area (OU1), street surfaces, the former PCG building and parking area, and many residential driveways. These areas drain to a storm sewer system with outfalls into Naylor's Run. Naylor's Run receives storm water flow from the entire nearby watershed.

Downstream from the outfall of the Site's TGTS discharge (NPDES-compliant), there is a nearly constant flow in Naylor's Run generated by the TGTS effluent. Although normally an intermittent stream, this portion of Naylor's Run becomes a perennially flowing stream due to this NPDES-compliant discharge.

The total flow in Naylor's Run combines treatment plant effluent combined with natural seepage originating at or near the ROS Area of the Site. Naylor's Run then flows through a series of natural and concrete-lined channels and pipes before entering Cobbs Creek. Channelization and surface runoff subject Naylor's Run to large volumes of water during storm events, resulting in severe stream scouring and erosion in the natural portions of stream channel areas. The confluence of Naylor's Run and Cobbs Creek is approximately 4 miles southeast of the Site. Cobbs Creek then joins Darby Creek and flows through Tinicum Marsh at the John W. Heinz National Wildlife Refuge before discharging into the Delaware River just east of Chester, Pennsylvania.

2.3.2 Soils and the Vadose Zone

Based on U.S. Department of Agriculture (USDA) soil maps, most of the soils in the Site area are classified as Made Land, derived from schist and gneiss materials. In this soil classification, the native soil profile has been disturbed by earth moving equipment, resulting in a heterogeneous soil mixture of surface material, the subsurface soils, and fragmented, partially weathered schist and gneiss rock.

A band of Glenville silt loam (GnB2) borders NWP on the north and east. It consists of a moderately eroded soil on 3 to 8% slopes and develops from weathering of schist and gneiss bedrock. The shallow soil profile is typically 3 to 6 feet deep and has a moderately low permeability. Weathering by-products of the underlying rock generally underlies deeper soils from 6 to 30 feet below grade. These deeper soils typically preserve some of the underlying rock structures (rock fragmented orientation and oriented permeability) and are typically anisotropic in the Wissahickon Formation. Site investigations have confirmed this general pattern of soil formation.

In the site vicinity, as much as 18 to 20 feet of fill soil exists above natural soil, depending on the area. Natural soil is similar to disturbed soil, and no clear soil horizon is identifiable at most drilling locations.

2.3.3 Geology and Hydrogeology

The Site is in the Piedmont Uplands section of the Piedmont Physiographic Province and is characterized by maturely dissected hills sloping gently to the southeast, underlain by a basement of crystalline igneous

and metamorphic rocks. The Piedmont Uplands section is the most southerly section of the Piedmont Province in Pennsylvania.

Consolidated rock in the vicinity of the Site consists of metamorphic schist and gneiss of the Wissahickon Formation. This formation, mapped as oligoclase-mica schist, makes up the bedrock beneath the study area.

Regionally, the unconsolidated deposits that overlay the bedrock consist of saprolite (in-situ weathered bedrock), occasional sand and gravel terrace deposits, and artificial fill. At the Site, the fill is thick (more than 18 feet thick near the former Young's Produce at the northwest corner of Eagle and Lawrence Roads). Near the collection trench and along the bed of Naylor's Run, thicker unconsolidated gravel deposits have been identified above the Wissahickon formation and appear to be related to a former channel of Naylor's Run.

Groundwater at the Site flows in a southeasterly direction and occurs in two major zones. The upper zone consists of surficial soils and saprolite (heavily weathered rock). The movement of water in the saprolite zone is influenced by the degree of saprolite weathering, relict bedrock structures, compositional variations, and the thickness of the weathered zone. Vertical hydraulic gradients are small, suggesting that the aquifer at the Site is well connected by porous/fracture flow.

The lower zone consists of fractured schist bedrock, with water movement occurring along interconnected fractures. Vertical hydraulic gradients are small, suggesting that the aquifer at the Site is well connected by fracture flow.

Upward flow occurs within the saturated saprolite and presumably provides observed seepage/base flow to Naylor's Run to the east of the current YMCA. The depth to groundwater below the Site ranges from approximately 23 feet below ground surface (bgs) in the vicinity of former Young's Produce Store to ground surface, where seepage occurs in low lying spots along Rittenhouse Circle and in the ROS Area, southeast of Rittenhouse Circle. Overall, the aquifer is permeable meaning the pore spaces are interconnected and allow for the flow of groundwater. While some zones in the aquifer are considered semi-confining, meaning they hinder the migration of groundwater flow, they are less prevalent.

2.4 Source, Nature, and Extent of Contamination

The source area of contamination at the Site was a wood-treatment facility operated by NWP, where wood products were treated from approximately 1947 to 1963 ("NWP Property").

The primary COCs at the Site are PCP, petroleum-related VOCs and SVOCs including benzene, ethylbenzene, toluene, xylene, PAHs, and dioxins/furans. PCP is found most consistently and at the highest concentrations throughout the Site.

Prior to the 2019 RSE and TCRA, the last CERCLA Site investigation was the OU3 Remedial Investigation (OU3 RI). The OU3 RI Report was finalized in 2007. The OU3 RI identified high concentrations of PCP (33,000 parts per billion [ppb]), dioxins (8.1 ppb), free-product oil, and many other organic and inorganic contaminants in the groundwater at the Site. A highly contaminated area with free-product oil was identified in the OU3 RI both northwest and southeast of Eagle Road, at a depth of 20 to 40 feet bgs, with concentrations of 7,000 to 8,000 ppb of PCP. The contamination in this portion of the aquifer is considered to be a Source Area and "principal threat waste" (PTW), which acts as a reservoir for continued migration of contamination. Groundwater contamination resulting from the NWP property and the Source Area continues to generate a dissolved plume, which migrates from this Source Area to the southeast, under the Haverford Area YMCA and towards several groundwater collection points. These groundwater collection points are on YMCA property, as well as on property to the east that was acquired by the United States Army Corps of Engineers (USACE) on behalf of EPA in accordance with CERCLA Section 104(j).[9] Several groundwater collection points are also present on residential properties near the YMCA.

More recent investigations conducted as part of the TCRA determined that the depth and horizontal extent of the Source Area, and the dissolved phase plume, are much larger than previously estimated. New monitoring wells installed on the GWTP property in 2021 identified light non-aqueous phase liquid (LNAPL), dense non-aqueous phase liquids (DNAPL), and maximum PCP concentrations of 16,000 ppb at a depth of 137 feet bgs. Further downgradient, maximum PCP concentrations of 400 ppb at a depth of 259 feet bgs were detected near the eastern edge of the YMCA parking lot. Additional investigations to fully delineate the lateral and vertical extent of the LNAPL, DNAPL, and dissolved phase plume are planned for 2023.

2.4.1 Streamlined Risk Evaluation

The purpose of the NTCRA that will be implemented following this EE/CA is to ensure that a long-term solution is instituted that will continue the hydraulic control and treatment of the groundwater contaminant plume. The OU2 interim remedy was the initial CERCLA action intended to address potential risks from contamination in the shallow aquifer. The final remedy for Site groundwater was selected in the OU3 ROD. The OU3 selected remedy addresses deep groundwater through the expansion of both the groundwater

[9] See 42 U.S.C. § 9604(j) (Acquisition of Property), which authorizes EPA to acquire real property it determines is needed to conduct a remedial action.

collection network and the GWTP (originally constructed under the OU2 interim remedy). As previously discussed, the GWTP has been demolished and the TGTS currently treats collected groundwater and discharges to Naylor's Run.

The NTCRA will overlap and be consistent with components of the actions selected in the OU2 and OU3 remedies, and it will directly address groundwater contamination to prevent future exposure. The 2008 OU3 ROD also addressed other secondary contaminant areas, including those with surface soil contamination and ongoing runoff to surface water.

There are no current known exposure pathways that are complete. Groundwater contamination is contained and captured by several groundwater collection wells, sumps, trenches, and french drains. Without permanent groundwater extraction, containment, and treatment at a treatment facility, the remediation of groundwater will cease, and the contaminant plume will again begin to expand from the Source Area and plume. This would reestablish exposure pathways that are currently eliminated as a result of the groundwater recovery system and actions taken during the TCRA (soil excavation, residential waterproofing, additional groundwater collection points). Contaminated groundwater and LNAPL were previously discharged directly to surface water bodies and residential structures and yards via seepage. Numerous residential surface drainage catch-basins also collect runoff from yards and discharge to the adjacent Naylor's Run.

If groundwater extraction, containment, and treatment was not currently occurring, the primary routes of potential future human exposure include:

1. Future residential child and adult receptor exposure to groundwater that has seeped to the surface and/or into residential basements and crawl spaces;

2. Future recontamination of soils that are used for residential and recreational purposes and exposure to child and adult residential and recreational receptors; and

3. Future release of contaminated groundwater via direct seepage at the groundwater/surface water interface, as well as overland flow and drainage into Naylor's Run, which is potentially available for recreational use.

These exposure pathways are currently prevented by the TGTS, groundwater recovery points and the residential waterproofing in crawl spaces and basements.

The OU3 ROD details the findings of the OU2 and OU3 human health risk assessments and the OU3 screening level ecological risk assessment (SLERA). The components of these risk evaluations that are relevant to the potential exposure pathways and future potential risks that the NTCRA will address are

summarized below. Groundwater RGOs were established in the OU3 ROD to establish the groundwater cleanup standards, which would be protective of human health and the environment for all the potential exposure scenarios that were evaluated and found to present potential unacceptable risks.

The OU2 groundwater risk assessment identified residential lifetime cancer risk[10] at 5×10^{-1} and non-cancer risk[11], adult hazard index (HI), at 5×10^{3} due to PAHs, PCP, and dioxin in the groundwater. The risk identified in the OU2 Risk Assessment provided the rationale for the OU2 1991 ROD, which selected the interim groundwater pump-and-treat remedy. The OU2 groundwater risk assessment also identified four contaminants (benzene, fluoranthene, trichloroethylene [TCE], and vinyl chloride) that were found in monitoring wells at the Site but were not known to be used during the wood treatment process at the NWP facility. These contaminants are thought to originate from sources upgradient of the Site.

OU3A was established in the OU3 ROD and addresses contamination related to deep groundwater in the Source Area. The OU3A future groundwater cancer risk is within the EPA acceptable cancer risk-management range (1×10^{-4} to 1×10^{-6}) and, therefore, was found not to present an unacceptable cancer risk to future residents at the Site. However, hypothetical future non-cancer HIs for OU3A groundwater were 10 for the adult resident and 20 for the child resident. These risks are primarily due to the SVOC 4,6-dinitro-2-methylphenol, the VOCs 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and the inorganic element barium.

The OU3 SLERA indicated that Site- related substances such as PCP may pose risks to ecological receptors.

Table 1 presents the Site's groundwater cleanup goals that were established in the OU3 ROD to address potential current or future risks and PTW in the Source Area (which is now known to be much larger than previously identified).

[10] EPA's target risk range for cancer risk is 1E-4 to 1E-6.
[11] A HI greater than unity (one) may represent an unacceptable risk.

Table 1: Groundwater Remedial Goal Objectives for Operating Unit 3 (OU3)

Groundwater Contaminant of Concern	OU3 Record of Decision Remedial Goal[a] (ppb)
Benzo(a)pyrene	0.2
Dieldrin	0.038[b]
Bis (2-ethylhexyl) phthalate	6
Dibenzofuran	4[b]
2-Methylnaphthalene	2[b]
Naphthalene	3[b,c]
Pentachlorophenol	1
Phenanthrene	41[b]
Total Dioxins (2,3,7,8-TCDD)	0.00003
1,2,4-Trimethylbenzene	16[b]
1,3,5-Trimethylbenzene	16[b]
4,6-Dinitro-2-methylphenol	1.7[b]
Aluminum	50-200[d]
Arsenic	10
Chromium	100
Barium	2,000
Manganese	50[d]
Iron	300[d]
Vanadium	3.1[b]

Notes:
a. Unless otherwise noted, remedial goal objectives are based on federal Maximum Contaminant Levels (MCLs)
b. Site-specific risk-based value
c. Site-specific risk-based value for risk to construction workers
d. Secondary MCL
µg/L = micrograms per liter = ppb
TCDD = tetrachlorodibenzo-p-dioxin

2.4.2 Analytical Data

The maximum detected concentration of PCP in a residential area of the Site was detected at an indoor sump (6.2 ppb); this concentration is greater than the OU3 ROD RGO of 1 ppb. The maximum detected recent (2022) concentration of PCP in a Rittenhouse Circle residential outdoor sump was 1,350 ppb. Subsurface PCP concentrations in shallow groundwater beneath residential yards was detected as high as 2,200 micrograms per liter (µg/L) in 2022. LNAPL has also been observed in a newly installed monitoring well between the local YMCA and a residential property that is downgradient from the YMCA property, which overlies the groundwater Source Area. Recent (2022) maximum PCP contamination in shallow groundwater (<120 feet bgs) exceeds 4,600 ppb. This contamination exists below the formerly known

maximum depth of the Source Area, is immediately upgradient of residential areas and Naylor's Run, and will further impact the aquifer.

Other Site COCs in groundwater recently detected above RGOs in shallow groundwater and commingled with PCP include TCE, benzene, 2-methylnaphthalene, dibenzofuran, naphthalene, 4,6-dinitro-2-methylphenol, and dioxins/furans.

The latest packer testing on bedrock borings (vertical holes drilled in bedrock that will be converted to monitoring wells) CW-36D, CW-37D, CW-38D, CW-39D, and CW-41D was conducted in February/March 2022, and groundwater samples were collected from several water bearing discrete intervals present at varying depths in each boring. Packer testing on boring CW-40D was last conducted in May 2020, after which the TGTS was installed, and CW-40D was no longer accessible for additional testing. Five of the six wells showed PCP concentrations greater than 1 ppb at each packer depth interval, except for well CW-38D, which showed PCP concentrations below 1 ppb in the deeper portions of the boring. Concentrations at shallower depths (<50 feet bgs) in well CW-38D reached up to 1,000 ppb. Concentrations of PCP vary within fractures and water bearing zones within each boring, however, there was no depth or zone throughout all the borings that presented consistent PCP concentrations. PCP concentrations vary greatly in value from as little as non-detectable in CW-16D to 16,000 ppb in CW-41D at 125 to 137 feet bgs. Figure 2 shows the groundwater sampling results from January 2022 with PCP concentrations in exceedance of the RGO detected in the above-mentioned wells as well as others. In general, the borings closest to the former treatment plant location show the highest PCP concentrations.

Multiple borings such as CW-39D, CW-38D, CW-37S and CW-36D show exceedances of 4,6-dinitro-2-methylphenol above its respective RGO of 1.7 ppb. Concentrations of this contaminant do not show either a tendency towards specific depths in the wells, nor is there a spatial clustering of wells with higher than RGO values for this SVOC.

Various dioxins/furans and SVOCs have been detected in excess of the RGOs, but no pattern with respect to a well's spatial relationship to another, nor the amount of contamination within a well, have been noted.

The analytical data from the January 2022 sampling event, collected from each monitoring well and boring, is included in Tables 1.A. and 1.B. in Appendix B. Figure 2 in Appendix A shows the known extent of the groundwater contamination plume.

Further study and additional data collection from ongoing groundwater sampling is warranted and planned for 2023.

3.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

RAOs form the basis for the development of the removal action alternatives and the selection of the preferred alternative. RAOs must also consider CERCLA's statutory limits for removal action, ARARs, and the ability of the alternatives to meet cleanup levels (for this Site, the RGOs selected in the 2008 OU3 ROD). In developing the RAOs for this NTCRA, statutory limits, risk assessment findings, available information regarding background contamination at the Site and the vicinity, and other applicable information were considered.

3.1 Statutory Limits on Removal Action

Section 104(c)(1) of CERCLA generally stipulates that Fund-financed removal actions be completed within 12 months and not exceed $2,000,000.[12] These limitations on the time and cost of removal actions may be waived in certain circumstances, including: (1) when EPA determines that continued response actions are immediately required to prevent, limit, or mitigate an emergency, and (2) when EPA determines that continued response action is otherwise appropriate and consistent with any remedial action to be taken ("the consistency waiver"). For this Site, based on initial cost-scoping of the removal alternatives discussed below, EPA determined that that the cost of the NTCRA will likely exceed $6,000,000. Consequently, consultation with EPA's Office of Superfund Remediation and Technology Innovation (OSRTI) was necessary before signing this EE/CA's Approval Memorandum (per relevant EPA guidance, *Use of Non-Time-Critical Removal Authority in Superfund Response Actions* [Feb. 14, 2000]). Consistent with this guidance, the EPA Region 3 team consulted with, and received the approval and concurrence of the Director of OSRTI, for performance of a NTCRA exceeding Section 104(c)(1)(A)'s statutory limit of $2,000,000. In addition, EPA believes that construction of the NTCRA may exceed the 12-month limit under Section 104(c)(1) and that a consistency waiver may be appropriate in this case to abate a foreseeable threat and to prevent further migration of contaminants at the Site.

3.2 Removal Action Objectives

The RAOs for the Site include the following:

1. Install and operate a new GWTS (a) to contain the groundwater contamination plume in the shallow and deep aquifers to prevent further migration of the plume and the discharge of COCs to surface water bodies; and (b) to ensure that groundwater downgradient of the Site is not impacted by COCs;

[12] 42 U.S.C. § 9604(c)(1).

2. Contribute to the long-term treatment of contaminated Site groundwater to achieve groundwater RGOs established in the 2008 OU3 ROD and discharge treated groundwater to surface water in concentrations that meet substantive limits established under NPDES; and

3. Contribute to and accelerate the long-term restoration of on-site groundwater to beneficial use.

3.3 Applicable or Relevant and Appropriate Requirements

In addition to determining the RAOs, EPA must also identify any ARARs under federal environmental law or more stringent ARARs promulgated under state environmental or facility-siting laws that must be attained while implementing the remedy that will achieve RAOs.

The NCP distinguishes *applicable* requirements from *relevant and appropriate* ones as follows:[13]

> *Applicable requirements* ". . . [are] those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable."
>
> *Relevant and appropriate requirements* ". . . [are] those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility-siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate."

Pursuant to Section 300.415(j) of the NCP, a Superfund-financed removal action selected under CERCLA § 104 must, to the extent practicable, considering the exigencies of the situation, attain ARARs.[14] In determining whether compliance with ARARs is practicable during a removal action, EPA will consider appropriate factors, including (1) the urgency of the situation and (2) the scope of the removal action to be conducted.[15] Other non-promulgated federal and state advisories, criteria, or guidance may, as appropriate,

[13] *See* 40 CFR § 300.5. Note: Once selected by EPA for a removal action, ARARs must be complied with, except as provided in 40 CFR § 300.415(j).
[14] 40 CFR § 300.415(j).
[15] 40 CFR §§ 300.415(j)(1)-(2).

also be considered by EPA in formulating the removal action.[16] Such advisories, criteria, or guidance are often referred to as "To Be Considered" material (TBCs). Once selected by EPA as a protective requirement, a TBC must be met during a response action. EPA policy provides that the development and evaluation of an NTCRA in an EE/CA must include removal alternatives that meet ARARs or TBCs and ensure protection of public health and the environment.

As defined by the NCP, ARARs (and TBCs) are divided into three categories: (1) chemical-specific (federal or state promulgated requirements that specifically address a hazardous substance, pollutant or contaminant found at a site); (2) location-specific (federal or state promulgated requirements that specifically address location or other circumstance found at a site); and (3) action-specific (federal or state promulgated requirements that specifically address the remedial or removal action at a site). EPA requested potential ARARs from PADEP on September 26, 2022, and received a response on January 13, 2023. This correspondence and the recommended ARARs are included in the Administrative Record file and Appendix C, respectively. Appendix C also includes descriptions of the specific ARARs or TBCs for this NTCRA.

3.4 Determination of Removal Schedule

Conceptual timeframes for each alternative are evaluated in Section 5 as part of the alternative evaluation.

4.0 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

Following a review of background data, analysis of the nature and extent of contamination, and development of RAOs, a limited number of removal alternatives have been developed for the Site. These alternatives were developed following consideration of applicable technologies and in consultation with PADEP.

4.1 Development of Alternatives

The objective of this section is to identify and analyze a limited range of removal action alternatives for the Site. In accordance with Section 104(a)(2) of CERCLA,[17] these alternatives are primarily designed to best contribute to the efficient performance of the remedial action already being taken at the Site. In addition, as recommended by CERCLA Section 121(b), the alternatives-selection process is informed by the preference for treatment over other approaches to address the principal threat at a site.[18] Although Section

[16] 40 CFR § 300.400(g)(3).
[17] 42 U.S.C. § 9604(a)(2).
[18] 42 U.S.C. § 9621(b)(1).

121(b) expressly applies to remedial action, EPA believes this preference is also an appropriate goal for removal actions, especially ones that will contribute to the efficient performance of the remedial action. In accordance with the NCP, the identified removal action alternatives have been evaluated in sufficient detail to allow the Director of the Superfund and Emergency Management Division to select a NTCRA based on relevant factors, including those described in 40 C.F.R. § 300.415.

The following factors were considered when developing the removal action alternatives:

- Removal alternatives often include an alternative that is used as a baseline scenario. For the Site EE/CA, removal alternatives were compared to a baseline of no action alternative (Alternative 1).
- The alternatives must provide a range of protectiveness to public health and the environment in achieving RAOs.
- The alternatives must be able to be implemented in a timely manner.

The following removal action alternatives were identified for the Havertown PCP Site:

- **Alternative 1**: EPA removes/abandons TGTS and performs no future removal action or monitoring.
- **Alternative 2:** EPA continues groundwater collection and treatment via the TGTS at 100 gpm, performs operation and maintenance (O&M) on the TGTS and existing groundwater collection points, and continues LTM of the Site remedy.
- **Alternative 3**: EPA constructs a new, permanent GWTP with at least 175 gpm capacity, installs additional recovery wells to contain Source Area PTW and the dissolved plume, dismantles the TGTS, and continues LTM

The no action alternative (Alternative 1) was selected as a baseline alternative against which other alternatives are compared. No action would consist of the removal or abandonment of the TGTS, and the EPA and PADEP would cease all removal and monitoring actions currently on-going at the Site.

Alternative 2 would continue operation of the current TGTS implemented during the TCRA, as described in Section 2.2 above, and groundwater monitoring at the Site. This alternative would not include installation of additional recovery wells to address other areas of the groundwater contaminant plume. Under this alternative, the current TGTS would continue to be housed in a non-permanent structure.

Alternative 3 would construct a new permanent GWTP and house it within a permanent building structure. Groundwater treatment and monitoring activities would continue, and the GWTP would have a treatment capacity of at least 175 gpm. The GWTP would be designed with a treatment train to address all Site COCs

established in the 2008 OU3 ROD. The new plant building would include room to install additional treatment technologies, if needed in the future.

Under Alternative 3, additional exploration would be performed at the Site to further delineate the horizontal and vertical extents of the Source Area and groundwater contaminant plume. Based on investigation findings, additional recovery wells would be installed to capture this contamination. Modeling of expected aquifer production during the design under the TCRA indicated an expected yield of approximately 10 gpm for each new deep recovery well (that is, three new recovery wells yield a total of 30 gpm on average). Recent 24-hour pump tests on four of the TCRA deep borings measured an average yield of 8 to 14 gpm. These pump test results are presented in Table 1.C. in Appendix B. Given the areal extent of the portion of the plume to be addressed by additional groundwater collection and the uncertainty of how each location could influence others, a minimum of four and a maximum of eight of the deep borings (or their equivalent in other locations on-site) would need to be converted to groundwater recovery wells. Four to eight additional recovery wells would result collect an additional 32 to 100 gpm of groundwater requiring treatment.

The NCP requires EPA to evaluate removal alternatives for the Site.[19] EPA's 1993 *Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA* ("*NTCRA Guidance*") states that "[a] limited number of alternatives, including any identified presumptive remedies, should be selected for detailed analysis. Each of the alternatives should be described in enough detail so that the entire treatment process can be understood."[20] The information presented in this section meets these criteria. Each of the alternatives was evaluated using the following three main criteria described in the *NTCRA Guidance*:

- **Effectiveness**—This criterion evaluates the effectiveness of a particular removal alternative relative to other alternatives of the same technology type. The evaluation of an alternative's effectiveness focuses on performance and the reliability of the technology and considers its stage of development (well-established, proven technologies are considered more reliable than those still in the experimental stages). This criterion also evaluates protectiveness to public health, community, residents, and workers during implementation; short- and long-term effectiveness; the level of treatment expected (reduction of toxicity, mobility, and volume); compliance with ARARs; and residual-effect concerns.

- **Implementability**—This criterion evaluates the implementability of a particular alternative, including both the technical and administrative feasibility of implementing a process option. The implementability criterion primarily evaluates the level of difficulty in overcoming technical and institutional concerns associated with a given technology. This evaluation includes

[19] 40 CFR § 300.415(b)(4)(ii).
[20] NTRCA Guidance at p. 34.

construction/operational considerations; time for implementation; availability of equipment, personnel, and services; state and community acceptance; and permits/approvals required.

- **Cost**—The element of cost may be unable to be adequately evaluated in the comparison process based on various unknowns regarding the implementation of the various alternatives. For this Site's EE/CA review, cost estimates were obtained based on general categories of costs (high, medium, or low), which are used to compare alternatives against one another.

A detailed evaluation and comparison of the three alternatives for the above criteria is presented in Sections 4.2 through 4.4.

4.2 Alternative 1 – No Action

Alternative 1 was evaluated as the baseline scenario against which other alternatives may be compared. Under the no-action alternative, no additional removal measures would be implemented, and the TGTS would be shut down and dismantled. Alternative 1 would not achieve RAOs. It would also not appropriately abate, stabilize, or mitigate the release or the threat of release of COCs at the Site and would, therefore, not address two NCP factors that EPA has determined are present at the Site, specifically: (i) the actual or potential exposure to nearby human populations, animals, or the food chain from COCs; and (ii) the actual or potential contamination of drinking water supplies or sensitive ecosystems.[21] Therefore, Alternative 1 would not be protective of the public health or welfare or the environment and will not be considered further.

4.3 Alternative 2 – Continue Temporary Groundwater Treatment System

Alternative 2 consists of continued use of the TGTS, which is currently operating at the Site; Alternative 2 would operate the TGTS at a maximum capacity of 100 gpm. The TGTS was installed to ensure continued protectiveness and to achieve progress towards achieving the RGOs for OU3 while a permanent solution for a new GWTP was implemented. Groundwater monitoring efforts are currently being shared between EPA and PADEP and would continue to be performed under Alternative 2. Alternative 2's effectiveness, implementability, and cost are evaluated below.

4.3.1 Effectiveness

The TGTS described in Alternative 2 is the same system currently being operated at the Site under the ongoing TCRA, which can treat up to 100 gpm of collected groundwater. Under Alternative 2, the TGTS would continue to treat groundwater collected from the infrastructure in the Collection Trench (CTR) area to the east of the YMCA, the Residential Area of the Site along Rittenhouse Circle, and the three recovery

[21] 40 C.F.R. §§ 300.415(b)(2)(i) and (ii).

wells (RW-5, RW-6, and RW-7), which collect groundwater from between 35 feet bgs and 120 feet bgs. The CTR-related and Rittenhouse points collect groundwater from just below ground surface down to the overburden-bedrock interface at approximately 18 feet bgs. Alternative 2 would appropriately abate, stabilize, or mitigate the release or the threat of release of COCs at the Site, would be protective of human health and the environment, and would be effective in the short-term as it ensures that shallow groundwater contamination is not entering residential areas or discharging to Naylors Run, which prevents direct exposure to Site COCs. There is no current potable use of the groundwater in this area, and the shallower portion of the known groundwater area is contained down to at least the depth of the deepest groundwater recovery wells at a maximum depth of 120 feet bgs.

However, Alternative 2 does not provide long-term effectiveness or permanence, and does not satisfy the first RAO for this NTCRA regarding contamination within the expanded Source Area and deep aquifer (that is, installation and operation of a new groundwater treatment system) (i) to contain the groundwater contamination plume in the shallow and deep aquifers to prevent further migration of the plume and the discharge of COCs to surface water bodies; and (ii) to ensure that groundwater downgradient of the Site is not impacted by COCs. Additional analysis is provided below.

First, Alternative 2 does not effectively capture the contamination within the deep aquifer. The deep bedrock borings and packer testing have documented the contaminant plume at depths of up to 300 feet bgs. The hydraulic influence of the existing recovery network has been modeled and demonstrates likely influences at depths lower than the existing pumping wells (that is, below 120 feet bgs). However, the extent of influence cannot be fully defined at this time based on information and wells available. Further, there are zones within the deeper aquifer that are likely beyond the influence of the existing groundwater pumping system. This means that the plume could expand or migrate because since it would not be addressed by the existing groundwater pumping system.

Second, to ensure the long-term effectiveness of the existing TGTS to contain the expanded contaminant plume, additional recovery wells would need to be installed at the Site. However, Alternative 2 does not include the installation of additional recovery wells because the TGTS does not currently have sufficient capacity to accommodate inflow from additional recovery wells. Also, installing and operating additional permanent recovery wells, which would be expected to run for 30+ years, does not align with the lifespan and current temporary nature of the TGTS. To expand the TGTS to handle increased groundwater treatment volumes from additional recovery wells and extend its lifespan, the current TGTS would need to be completely dismantled and removed. A larger temporary system could be reinstalled, but there would be spatial restrictions on the current NWP Property that would prohibit a temporary system of adequate size,

while also allowing for access, stormwater management, equipment storage and parking, and other support logistics.

In addition, the TGTS in Alternative 2 does not utilize ultraviolet oxidation (UV/OX) to treat dioxins and furans which was used in the original GWTP. Dioxins/furans in the TGTS influent are currently near or below NPDES discharge standards, and the current treatment process discharges water with all COCs, including dioxins/furans below the required limit. It is uncertain if a new UV/OX system could be added to the TGTS should dioxins/furans increase in the future due to additional plume capture or other changed Site conditions. The lack of a weatherized building and the substantial increase in electrical requirements likely would prohibit using UV/OX if Alternative 2 is selected. In summary, long-term use of the TGTS would not provide long-term effectiveness or achieve all RAOs.

Under Alternative 2, compliance with ARARs would likely be achieved. Captured groundwater is currently treated by the TGTS to NPDES-based limits before being discharged to Naylors Run. Sludge generated from the treatment process is disposed in accordance with hazardous waste standards that are relevant and appropriate for the Site. Other ARARs listed in Appendix C would be achieved under Alternative 2.

The TGTS in Alternative 2 would reduce the toxicity, mobility, and volume of contaminants through the groundwater treatment and disposal processes. Contaminants are removed from groundwater through several steps that bind and chemically alter the compounds. The sludge collected at the end of the treatment process is shipped to an off-site incineration and disposal facility. The granular activated carbon utilized in the TGTS binds and sequesters certain organic compounds. This carbon is eventually shipped off-site to be stripped and regenerated, with the resulting contaminants being disposed at a permitted facility, and any carbon that cannot be regenerated is also disposed of properly at an off-site facility. This process reduces the COCs to concentrations in the effluent that meet their respective substantive limits established under NPDES-permit equivalency.

4.3.2 Implementability

The TGTS has already been implemented by EPA Region 3's Preparedness and Response Branch, and an EPA On-Scene Coordinator oversees its operation. No additional resources beyond those currently utilized for operation of the TGTS would be required to implement Alternative 2 in the short term.

However, Alternative 2 would not contribute to the efficient performance of the long- term remedial action with respect to the releases or threatened releases at the Site, as required by Section 104(a)(2) of CERCLA.[22] The TGTS was implemented as a temporary measure, and its equipment and capacity are not sufficient for long-term treatment of groundwater at the Site. The expected lifespan of the equipment currently in use is approximately 5 years or less. Frequent and increased maintenance and replacement of TGTS components would be required over time due to their decreased durability. The time needed for maintenance or for expansion of the TGTS to provide increased treatment capacity would lead to temporary shutdowns of TGTS operations. As a result, plume containment and treatment would be diminished, potentially allowing for suboptimal performance or loss of plume control. The short-term implementability of Alternative 2 is straightforward, but implementation becomes more complex and challenging as the age of the TGTS increases.

4.3.3 Cost

Anticipated costs for implementation of Alternative 2 include:

- Annual equipment rental and operation of the TGTS
- Recovery well maintenance
- Monthly utility costs
- Quarterly groundwater monitoring and NPDES compliance confirmation

Because Alternative 2 is in place, there is no initial cost associated for implementation of Alternative 2. The average cost to continue using the TGTS under Alternative 2 is estimated to be $1,657,500 per year. A detailed cost estimate for this alternative is presented in Table 3.A in Appendix D.

4.4 Alternative 3 – Construct New Groundwater Treatment Plant as Designed

Alternative 3 consists of constructing a new GWTP that has a minimum treatment capacity of 175 gpm and that is housed inside of a permanent building structure. New stormwater management controls would be constructed to convey water from the GWTP property. Once the GWTP is completed and demonstrates consistent attainment of NPDES discharge limits, the TGTS would be dismantled and removed from the Site. Up to eight additional recovery wells, each with an estimated maximum pumping rate of 14 gpm, and associated piping would be installed to ensure capture of the expanded Source Area and dissolved-phase contaminant plume. Construction would be required to install all of the needed infrastructure for the new

[22] 42 U.S.C. § 9604(a)(2).

recovery wells. GWTP discharge and groundwater monitoring of new components installed under the TCRA and this Alternative, as well as new monitoring wells, would continue to be performed under Alternative 3.

4.4.1 Effectiveness

Alternative 3 would be protective of human health and the environment and would provide short-term effectiveness as well as long-term effectiveness and permanence. As with Alternative 2, the new, larger GWTP in Alternative 3 would continue to pump and treat the Source area and dissolved-phase contaminant plume to ensure no contamination is being released into residential areas or Naylors Run. The GWTP would be enclosed inside a weatherproof building with necessary utilities and security measures to ensure long-term operation, and the stormwater management system on the NWP Property would be updated and expanded to convey stormwater.

Additional deep recovery wells would be installed either in existing bedrock borings or in new borings drilled as a result of investigations that delineate the vertical and horizontal extent of the Source Area PTW and contaminant plume. The estimated depth of the new recovery wells ranges from 250 to 400 feet bgs. A minimum of four (4) and a maximum of eight (8) new deep recovery wells are assumed under Alternative 3. Depending on how many recovery wells are installed, these new wells would result in an additional 32 to 100 gpm of recovered groundwater that requires treatment (depending on well yield and the overall pumping strategy; that is, always pumping at maximum rate versus pumping at varying rates through pulsing or other means). These additional deep recovery wells would ensure long-term effectiveness and permanence as they will contain the contamination, prevent further migration, and constantly remove it from the aquifer for treatment. The GWTP would have the capacity and capability to treat all Site COCs, including dioxins/furans through UV/OX and any collected pure phase oils via an oil/water separator. Should UV/OX be required, an air stripper would also be used to address volatile compounds that are generated during this process.

Alternative 3 would comply with all the identified ARARs, including those pertaining to air emissions and stormwater management. The demolished GWTP and TGTS both have regularly achieved the NPDES-based discharge limits. The new GWTP would be based on the same treatment processes, just at larger scale, and as such, achieving NPDES-based discharge limits would be attainable.

The new GWTP would reduce the toxicity, mobility, and volume of contaminants in the same manner as described under Alternative 2. Additionally, should UV/OX be necessary to address dioxins/furans, these compounds would be chemically degraded by the treatment process.

4.4.2 Implementability

The engineered design of the new GWTP would be similar to the previous GWTP and the current TGTS, only it would be more robust. As such, the GWTP construction and operation would be readily implementable. Building materials and treatment plant process components and chemicals that would be used in the GWTP are commonly used in other waste-water treatment systems. The area where the GWTP and adjacent stormwater management system would be constructed is vacant and ready for construction. No further site clearing is necessary. The TGTS is located in a set-aside portion of the NWP property that would not interfere with GWTP construction and operations.

The USACE, on behalf of EPA, currently owns the real property where the GWTP and CTR area are located, and USACE has acquired easements for all existing infrastructure as a result of the previous Site remedial actions for OU2 and OU3. Additional construction and property access may be needed for one or more new recovery wells, depending on location.

The drilling and construction of new borings and recovery wells is standard practice with known methods that have previously been employed on-site. Additional infrastructure connecting the recovery wells to the GWTP could be implemented through open construction and/or directional drilling. Some piping might need to pass under Eagle Road and/or the access road that cuts through the EPA NWP Property. This would require coordination for road-cuts and disturbance with PennDOT and Haverford Township, which have previously cooperated with EPA for other work during implementation of the remedial action at this Site. EPA anticipates their further cooperation in the future, if necessary.

4.4.3 Cost

Costs associated with Alternative 3 are anticipated to be incurred for the following response actions:

- Initial construction of the GWTP;
- Installation of additional recovery wells, piping to the GWTP, and associated appurtenances;
- Twelve (12) or more[23] months of operation of the GWTP to monitor the system's effectiveness at handling the increased volume of ground water and at removing COCs from groundwater, including quarterly groundwater monitoring and confirmation of compliance with NPDES discharge limits; and

[23] Actions beyond 12 months will be subject to approval of a consistency waiver under 42 U.S.C. § 9604(c)(1)(C).

- Post-removal site controls to sustain the integrity of the NTCRA, including the GWTP, until responsibility for the GWTP is transferred to the EPA Region 3 Site Remediation Branch and to PADEP, as required under CERCLA § 9604(c)(3) and NCP § 300.435(f).

The estimated cost for construction of the GWTP and up to eight new recovery wells under Alternative 3 is $16,290,006. The annual cost to operate the GWTP including any related post-removal site controls and monitoring is estimated to be $1,815,220. The estimated cost to operate the GWTP until deemed operational and functional and transition to PADEP is $3,894,440. This assumes up to 24 months of operation by EPA. The estimate total cost for Alternative 3 as described above is $20,184,446.

Under Alternative 3, EPA would construct the GWTP and initiate operations for at least 12 months to ensure proper performance and optimization. Once proper GWTP performance is demonstrated, operation of the GWTP would transition to the Site Remediation Branch under a new EPA contract designed for long-term remedial actions, including groundwater treatment facilities. Operation of the GWTP by EPA would continue until it is deemed operational and functional by EPA and PADEP, as required by Section 300.435(f)(2) of the NCP.[24] At that time, PADEP would take over all Site O&M responsibilities for the GWTP, recovery wells, and other remedy features, subject to an amended Superfund State Contract under Section 104(c)(3) of CERCLA and Section 300.510 of the NCP.[25]

As under Alternative 2, the components and monitoring wells installed as part of the TCRA and NTCRA would be regularly monitored and evaluated to assess the GWTP and groundwater recovery network performance in attaining RAOs. A detailed cost estimate for Alternative 3 is presented in Table 3.B. in Appendix D.

5.0 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

Alternative 1, No Action, would not address contaminants present in the groundwater at the Site, would not meet RAOs, would not be protective of human health and the environment, and would not attain ARARs under this NTCRA or contribute to the attainment of ARARs selected for the OU3 remedial action. The no-action alternative would also not contribute to the efficient performance of the long-term remedial action, including meeting RGOs, for OU3, as required under Section 104(a)(2) of CERCLA. Accordingly, Alternative 1 is noy further evaluated in this EE/CA.

[24] 40 C.F.R. § 300.435(f)(2).
[25] *See* 42 U.S.C. § 9604(c)(3) and 40 C.F.R. § 300.510.

Alternative 2, Continue Temporary Groundwater Treatment System, would only satisfy two of the RAOs for the NTCRA, as it would not address contamination within the deeper portions of the groundwater plume.

Alternative 3, Construct New Groundwater Treatment Plant as Designed, would address all of the groundwater contamination within the aquifer once additional recovery wells are installed and would ensure containment of the contaminant plume. Alternative 3 would provide greater short-term protectiveness and would be protective of human health and the environment. Alternative 3 is also the only alternative that would provide long-term effectiveness and permanence.

Both Alternative 2 and Alternative 3 would attain the ARARs identified for this NTCRA.

Alternative 2 would be more easily implemented than Alternative 3 simply because it is already in place. However, continued operation of the TGTS under Alternative 2 would be more challenging over time when compared to the GTWP because many of the TGTS's features and components are not intended to be permanent and would wear out more quickly, requiring more funding for maintenance. Alternative 3 can be readily implemented via construction and plant start-up and testing to ensure proper operation. Less long-term maintenance would be required for Alternative 3 than for the continued operation of the TGTS under Alternative 2.

PADEP concurred on the OU3 ROD, which selected the original GWTP, and it operated the old GWTP under a Superfund State Contract (SSC) beginning in 2013. EPA has coordinated with PADEP and Haverford Township throughout the TCRA. EPA has coordinated with PADEP on ARARs for the TCRA and the proposed NTCRA. PADEP has been supportive of EPA's planning and implementation of these response actions. Haverford Township has offered comments on previous designs for the GWTP and is supportive of construction of a new GWTP to ensure remediation of the groundwater contamination.

Alternative 3 has a higher estimated capital and operational cost than Alternative 2, as the TGTS is already assembled. Because the GWTP would be more robust and treat a larger volume of groundwater, the costs of operation, utilities, and chemicals for Alternative 3 would consequently be greater. However, the expected maintenance costs over time are lower for Alternative 3 than they would be for Alternative 2.

6.0 RECOMMENDED REMOVAL ACTION ALTERNATIVE

The recommended NTCRA is Alternative 3 - Construct New Groundwater Treatment Plant as Designed. Alternative 3 is the only alternative evaluated that would achieve long-term protectiveness of human health and the environment and Site RAOs. It would also attain established ARARs.

Alternative 3 will construct a new permanent GWTP and house it within a permanent building structure. Groundwater treatment and monitoring activities would continue, and the GWTP would have a treatment capacity of at least 175 gpm. The GWTP would be designed with a treatment train to address all Site COCs established in the 2008 OU3 ROD. The new plant building would have extra room to install additional treatment technologies, if needed in the future.

Under Alternative 3, additional site investigation would be performed at the Site to further delineate the horizontal and vertical extents of the Source Area and deep groundwater contaminant plume. Additional recovery wells would then be installed to capture this contamination. Given the spatial size of the portion of the plume to be addressed by additional groundwater collection and the uncertainty of how each location could influence others, a minimum of four and a maximum of eight of the deep borings (or their equivalent in other locations on-site) would be converted to groundwater recovery wells. Four to eight additional recovery wells would result in an additional estimated 32 to 100 gpm of groundwater requiring treatment.

7.0 REFERENCES

U.S. Environmental Protection Agency (EPA). 1993. “Guidance on Implementation of the Revised Statutory Limits on Removal Actions" Office of Solid Waste and Emergency Response 9360.0-32. August.

EPA. 2015. “PART 300 - National Oil and Hazardous Substances Pollution Contingency Plan.” July.

EPA. 2016. “Memorandum Regarding Consideration of Greener Cleanup Activities in the Superfund Cleanup Process” August.

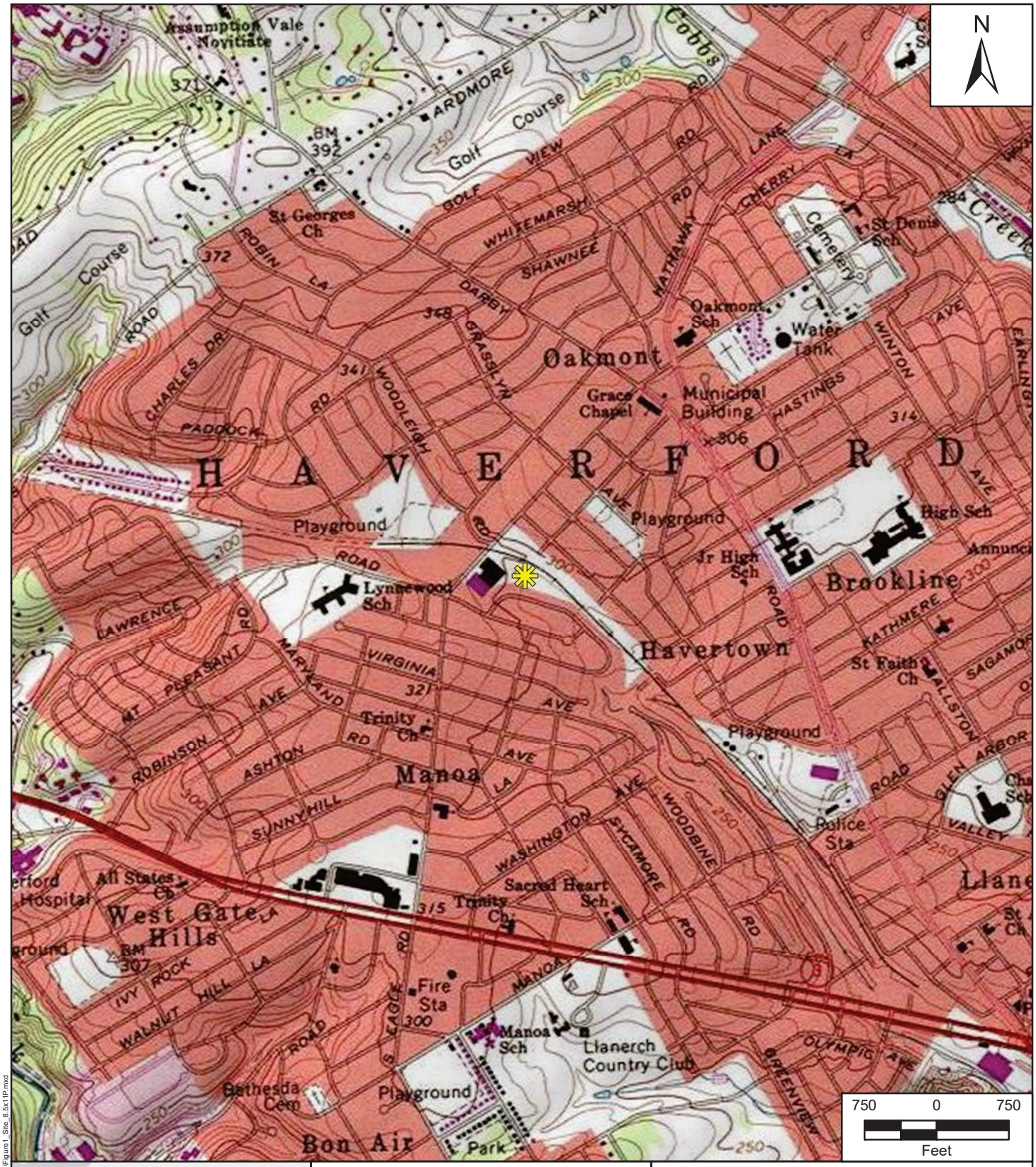
EPA. 1989. Havertown PCP Operable Unit 1 Record of Decision. September 11.

EPA. 1991. Havertown PCP Operable Unit 2 Record of Decision. September 30.

EPA. 2008. Havertown PCP Superfund Site Operable Unit 3 Record of Decision. April 16.

APPENDIX A

FIGURES



Legend

Site Location

Source: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
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Havertown PCP Site
Havertown, Delaware County, PA

Figure 1

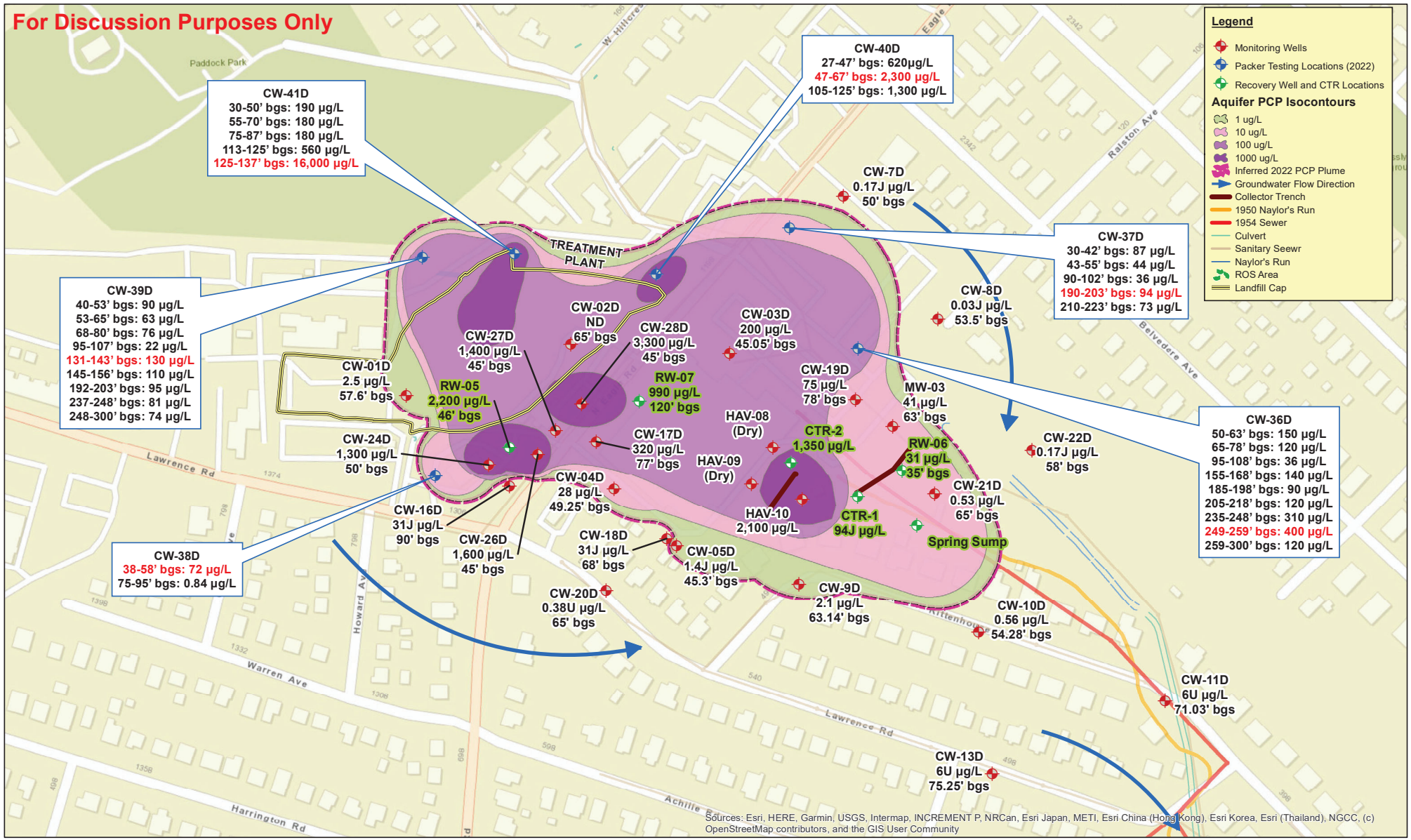
Topographic Site Map

TETRA TECH

Prepared For: EPA R3 START VI | Prepared By: M. Kelly

File Path: S:\06_Technical_Documents\903401\20_07_019\Figure1_Site_8.5x11P.mxd

Date Saved: 12/15/21 | EPA Contract No: 68-HE-032-D0003 | TD No: T601-20-07-019 | Coordinate System: NAD 1983 2011 StatePlane Pennsylvania South FIPS 3702 Ft US



TETRA TECH

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Note:
- Concentrations shown represent groundwater samples collected at various depths and during different sampling events. Isocontours shown should not be interpreted to represent the current PCP plume, but to show where both historical and current contaminant hot spots and data gaps exist.

N W E S

0 55 110 220 330 440 Feet

FIGURE 2 - MONITORING WELLS SAMPLED JANUARY THROUGH MARCH 2022
ANALYTICAL PCP RESULTS AND GROUNDWATER CONTAMINATION PLUME
HAVERTOWN PCP SUPERFUND SITE
DELAWARE COUNTY
HAVERTOWN, PENNSYLVANIA

S:\06_Technical_Documents\9034_START_R3\0120_07_019\Figure2_MW2022Results.mxd

Havertown PCP Site
Havertown, Delaware County, Pennsylvania

Figure 3

Recovery Well Location Map

TETRA TECH

Prepared For: EPA R3 START VI
Prepared By: K. Orzada
Coordinate System: NAD 1983 2011 StatePlane Pennsylvania South FIPS 3702 Ft US

Date Saved: 01/31/23
EPA Contract No: 68HE0320D0003
TD No: T601-20-07-019

APPENDIX B

ANALYTICAL DATA

Table 1.A
SITE-WIDE SAMPLING ANALYTICAL RESULTS
HAVERTOWN PCP SUPERFUND SITE
HAVERTOWN, PENNSYLVANIA

Sample IDs	Remediation		CTR-01		RW-05		RW-06		RW-07		CW-10D		CW-10S		CW-14D		CW-14S		CW-16D		CW-16S		CW-17D		CW-18D		CW-19D	
Sample Dates	**Goal for**		**1/25/2022**		**1/26/2022**		**1/25/2022**		**1/25/2022**		**1/20/2022**		**1/20/2022**		**1/24/2022**		**1/24/2022**		**1/17/2022**		**1/18/2022**		**1/27/2022**		**1/21/2022**		**1/19/2022**	
Well Depth	**Groundwater**	**Feet**	**Unknown**		**46.00**		**35.00**		**120.00**		**54.28**		**24.30**		**82.21**		**40.55**		**90.00**		**55.00**		**78.00**		**68.00**		**101.00**	
Analyte		**Result Unit**	**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**	
Pesticides																												
Dieldrin	0.038	µg/L	0.14	J	0.041	J	0.077	J	0.031	J	0.12		0.33		0.1	U	0.1	U	0.15		0.1	U	0.1	U	0.04	J	0.1	U
Dioxin	**pg/L**																											
2,3,7,8-TCDD	0.03	pg/L	1.1	U	1	U	0.98	U	0.98	U	0.94	U	3.4	U	1	U	0.92	U	2.5	J	4.9	J	0.98	U	0.95	U	0.92	U
TEQ (Mammal)	30000	pg/L	0.3		3.4		0.085		0.63		0.73		0.014		0.0093		0.0018		51		95		19		1.3		0.36	
SVOC's	**µg/L**																											
2-Methylnaphthalene	2	µg/L	0.1	U	4.1	J	0.04	J	5	U	0.02	J	0.1	U	0.1	U	0.1	U	0.1	U	7.5		5	U	0.1	U	0.1	U
4,6-Dinitro-2-methylphenol	1.7	µg/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Benzo(a)pyrene	0.2	µg/L	0.1	U	5	U	0.1	U	5	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	J	5	U	0.1	U	0.1	U
Bis(2-ethylhexyl)phthalate	6	µg/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Dibenzofuran	4	µg/L	5	U	3.8	J	5	U	2.1	J	5	U	5	U	5	U	5	U	5	U	2.1	J	5	U	5	U	5	U
Naphthalene	3	µg/L	0.1	U	14		0.08	J	1.3	J	0.04	J	0.1	U	0.1	U	0.1	U	0.1	U	50	J	5	U	0.1	U	0.07	J
Pentachlorophenol	1	µg/L	94	J	2200		31		990		0.56		0.2	U	0.2	U	0.2	U	43	J	3.5		320		31	J	75	
Phenanthrene	41	µg/L	0.1	U	12		0.04	J	1.1	J	0.05	J	0.1	U	0.1	U	0.1	U	0.03	J	7.1		5	U	0.02	J	0.03	J
Inorganics	mg/L																											
Aluminum, Total	0.2	mg/L	0.089	U	0.089	U	0.089	U	0.089	U	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Arsenic, Total	0.01	mg/L	0.0033	U	0.0052		0.0033	U	0.0013	J	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Iron, Total	0.3	mg/L	0.47		20.5		62		10.4		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Manganese, Total	0.05	mg/L	3		9.7		1.7		4.2		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Vanadium, Total	0.0031	mg/L	0.0022	U	0.0022	U	0.0022	U	0.0022	U	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	

Notes:
NA - Not Analyzed
mg/L - Milligrams per Liter
µg/L - Micrograms per Liter
pg/L - Picograms per Liter
J - Estimated Value
U - Not Detected Above Laboratory Quantitation Limit
Highlight indicates a result that exceeds the Remediation Goal for groundwater.

Table 1.A
SITE-WIDE SAMPLING ANALYTICAL RESULTS
HAVERTOWN PCP SUPERFUND SITE
HAVERTOWN, PENNSYLVANIA

Sample IDs	Remediation		CW-1D		CW-1I		CW-1S		CW-20D		CW-21D		CW-22D		CW-22S		CW-23D		CW-24D		CW-26D		CW-27D		CW-28D		CW-2I	
Sample Dates	**Goal for**		**1/19/2022**		**1/19/2022**		**1/19/2022**		**1/25/2022**		**1/17/2022**		**1/17/2022**		**1/17/2022**		**1/19/2022**		**1/18/2022**		**1/18/2022**		**1/19/2022**		**1/19/2022**		**1/27/2022**	
Well Depth	**Groundwater**	**Feet**	**57.60**		**34.10**		**21.30**		**66.00**		**65.00**		**55.00**		**28.30**		**50.00**		**50.00**		**45.00**		**45.00**		**45.00**		**41.20**	
Analyte		**Result Unit**	**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**	
Pesticides																							0.1	U				
Dieldrin	0.038	µg/L	0.1	U	0.1	U	0.016	J	0.16		0.1	U	0.27		0.21		0.13		0.1	U	0.1	U	0.05	U	0.1	U	0.1	U
Dioxin	**pg/L**																											
2,3,7,8-TCDD	0.03	pg/L	0.73	U	0.7	U	0.79	U	0.97	U	0.76	U	0.77	U	0.76	U	0.86	U	3.1	J	0.8	U	0.78	U	0.86		1	U
TEQ (Mammal)	30000	pg/L	1.1		0.064		0.066		0.87		9.5		0.059		0.0045		0.89		11		0.28		0.26		1.2		12	
SVOC's	**µg/L**																											
2-Methylnaphthalene	2	µg/L	0.02	J	0.1	U	0.1	U	0.1	U	0.24		0.03	J	0.1	U	0.1	U	3.1	J	5	U	10	U	5	U	5	U
4,6-Dinitro-2-methylphenol	1.7	µg/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Benzo(a)pyrene	0.2	µg/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.03	J	0.1	U	0.29		5	U	5	U	5	U	5	U	5	U
Bis(2-ethylhexyl)phthalate	6	µg/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Dibenzofuran	4	µg/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	4.9	J	1.6	J	5	U	2.9	J	5	U
Naphthalene	3	µg/L	0.11		0.1	U	0.1	U	0.1	U	0.14		0.1	U	0.1	U	0.1	U	25		2.7	J	5	U	2.2	J	5	U
Pentachlorophenol	1	µg/L	2.5		4.6		33		0.38	U	0.53		0.19	J	0.21		0.07	J	1300		1600		3.2	J	3300		4200	
Phenanthrene	41	µg/L	0.03	J	0.03	J	0.03	J	0.1	U	0.07	J	0.07	J	0.1	U	0.29		21		4.2	J	10	U	6.8		5	U
Inorganics	mg/L																											
Aluminum, Total	0.2	mg/L	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Arsenic, Total	0.01	mg/L	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Iron, Total	0.3	mg/L	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Manganese, Total	0.05	mg/L	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Vanadium, Total	0.0031	mg/L	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	

Notes:
NA - Not Analyzed
mg/L - Milligrams per Liter
µg/L - Micrograms per Liter
pg/L - Picograms per Liter
J - Estimated Value
U - Not Detected Above Laboratory Quantitation Limit
Highlight indicates a result

Table 1.A
SITE-WIDE SAMPLING ANALYTICAL RESULTS
HAVERTOWN PCP SUPERFUND SITE
HAVERTOWN, PENNSYLVANIA

Sample IDs	Remediation		CW-36D		CW-37D		CW-37S		CW-38D		CW-38S		CW-39D		CW-39S		CW-3D		CW-41S		CW-4D		CW-5D		CW-7D		CW-7S	
Sample Dates	**Goal for**		**1/21/2022**		**1/24/2022**		**1/21/2022**		**1/20/2022**		**1/18/2022**		**1/20/2022**		**1/20/2022**		**1/20/2022**		**1/24/2022**		**1/21/2021**		**1/25/2022**		**1/17/2022**		**1/20/2022**	
Well Depth	**Groundwater**	**Feet**	**300.00**		**223.00**		**Unknown**		**147.00**		**Unknown**		**300.00**		**Unknown**		**45.05**		**Unknown**		**49.25**		**45.30**		**49.60**		**29.40**	
Analyte		**Result Unit**	**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**	
Pesticides																												
Dieldrin	0.038	µg/L	0.042	J	0.1	U	0.1	U	0.18		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.049	J	0.1	U	0.008	J	0.01	J
Dioxin	**pg/L**																											
2,3,7,8-TCDD	0.03	pg/L	1.2	U	0.95	U	1.2	U	0.68	U	0.84		0.7	U	0.69	U	0.95	U	0.95	U	1.1	U	1	U	0.8	U	0.82	U
TEQ (Mammal)	30000	pg/L	0.094		0.0036		0.42		0.0025		21		0.24		75		0.2		0.14		4.3		1.8		0.09		0.98	
SVOC's	**µg/L**																											
2-Methylnaphthalene	2	µg/L	0.1	U	0.1	U	0.1	U	0.1	U	85		0.1	U	5	U	5	U	0.1	U	0.1	U	0.1	U	0.07	J	0.1	U
4,6-Dinitro-2-methylphenol	1.7	µg/L	10	U	10	U	10	U	10	U	10	U	10	u	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Benzo(a)pyrene	0.2	µg/L	0.1	U	0.1	U	0.1	U	0.1	U	5	U	0.1	U	5	U	5	U	0.1	U	0.1	U	0.1	U	0.1	U	0.02	J
Bis(2-ethylhexyl)phthalate	6	µg/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Dibenzofuran	4	µg/L	5	U	5	U	5	U	5	U	2.6	J	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Naphthalene	3	µg/L	0.1	U	0.05	J	0.1	U	0.03	J	120		0.1	U	5	U	5	U	0.1	U	0.14		0.1	U	0.05	J	0.1	U
Pentachlorophenol	1	µg/L	35		3.9		0.34		1.2		1000		99	J	700		200		0.48		28		1.4	J	0.17	J	0.46	J+
Phenanthrene	41	µg/L	0.04	J	0.1	U	0.03	J	0.04	J	14		0.1	U	5	U	5	U	0.1	U	0.12		0.04	J	0.02	J	0.1	U
Inorganics	mg/L																											
Aluminum, Total	0.2	mg/L	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Arsenic, Total	0.01	mg/L	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Iron, Total	0.3	mg/L	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Manganese, Total	0.05	mg/L	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Vanadium, Total	0.0031	mg/L	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	

Notes:
NA - Not Analyzed
mg/L - Milligrams per Liter
µg/L - Micrograms per Liter
pg/L - Picograms per Liter
J - Estimated Value
U - Not Detected Above Laboratory Quantitation Limit
Highlight indicates a result

Table 1.A
SITE-WIDE SAMPLING ANALYTICAL RESULTS
HAVERTOWN PCP SUPERFUND SITE
HAVERTOWN, PENNSYLVANIA

Sample IDs	Remediation		CW-8D		CW-8S		CW-9D		CW-09S		HAV-07		HAV-10		IW-01		MW-03		MW-1S		NW-6-81	
Sample Dates	**Goal for**		**1/17/2022**		**1/18/2022**		**1/25/2022**		**1/20/2022**		**1/26/2022**		**1/26/2022**		**1/25/2022**		**1/24/2022**		**1/24/2022**		**1/25/2022**	
Well Depth	**Groundwater**	**Feet**	**53.50**		**30.00**		**63.14**		**35.60**		**8.82**		**17**		**28.71**		**63.00**		**Unknown**		**24.00**	
Analyte		**Result Unit**	**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**	
Pesticides																						
Dieldrin	0.038	µg/L	0.4		0.5		0.08	J	0.42		0.35	J	0.019	J	0.1	U	0.019	J	0.1	U	0.013	J
Dioxin	**pg/L**																					
2,3,7,8-TCDD	0.03	pg/L	0.78	U	0.75	U	1	U	0.84	U	0.94	U	0.95	U	0.97	U	0.95	U	1	U	0.99	U
TEQ (Mammal)	30000	pg/L	0.54		0.21		0.58		0.069		0.17		1.7		4.1		0.21		1.3		3.2	
SVOC's	**µg/L**																					
2-Methylnaphthalene	2	µg/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	5	U	5	U	0.1	U	2		5	U
4,6-Dinitro-2-methylphenol	1.7	µg/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Benzo(a)pyrene	0.2	µg/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	5	U	5	U	0.1	U	0.1	U	5	U
Bis(2-ethylhexyl)phthalate	6	µg/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Dibenzofuran	4	µg/L	5	U	5	U	5	U	5	U	5	U	2.6	J	5	U	5	U	5	U	5	U
Naphthalene	3	µg/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	5	U	5	U	0.1	U	0.71		5	U
Pentachlorophenol	1	µg/L	0.03	J	0.2	U	2.1		0.2	U	1.8		2100		1800		41		0.2	U	860	
Phenanthrene	41	µg/L	0.1	U	0.1	U	0.02	J	0.1	U	0.1	U	1.7	J	5	U	0.1	U	0.1	U	5	U
Inorganics	mg/L																					
Aluminum, Total	0.2	mg/L	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Arsenic, Total	0.01	mg/L	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Iron, Total	0.3	mg/L	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Manganese, Total	0.05	mg/L	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Vanadium, Total	0.0031	mg/L	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	

Notes:
NA - Not Analyzed
mg/L - Milligrams per Liter
µg/L - Micrograms per Liter
pg/L - Picograms per Liter
J - Estimated Value
U - Not Detected Above Laboratory Quantitation Limit
Highlight indicates a result

Table 1.B
FEBRUARY/MARCH 2022 PACKER TESTING ANALYTICAL RESULTS
HAVERTOWN PCP SUPERFUND SITE
HAVERTOWN, PENNSYLVANIA

Sample ID's	Remediation	CW-36D-50-65		CW-36D-65-80		CW-36D-95-110		CW-36D-155-165		CW-36D-185-195		CW-36D-205-215		CW-36D-235-245		CW-36D-249-259		CW-36D-259-300	
Date Sampled	Goal for	3/7/2022		3/8/2022		3/8/2022		3/9/2022		3/9/2022		3/10/2022		3/10/2022		3/11/2022		3/14/2022	
Depth (ft bgs)	Groundwater	50 - 65		65 - 80		95 -100		155 - 165		185 - 195		205 - 215		235 - 245		249 - 259		259 - 300	
Analyte		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Semivolatiles	µg/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
2-Methylnaphthalene	2	5.3	U	5.1	U	0.027	J	5	U	0.27		0.35		5	U	5.1	R	5	R
4,6-Dinitro-2-methylphenol	1.7	11	U	10	U	10	U	10	U	10	U	10	U	10	U	10	R	10	R
Benzo(a)pyrene	0.2	5.3	U	5.1	U	0.1	U	5	U	0.1	U	0.1	U	5	U	5.1	R	5	R
bis(2-ethylhexyl)phthalate	6	5.3	U	5.1	U	5.2	U	5	U	5	U	5	U	5	U	5.1	R	5	R
Dibenzofuran	4	5.3	U	5.1	U	5.2	U	5	U	5	U	5	U	5	U	5.1	R	5	R
Naphthalene	3	5.3	U	5.1	U	0.15		5	U	0.96		1.5		5	U	5.1	R	5	R
Pentachlorophenol	1	**150**		**120**		**36**		**140**		**90**		**120**		**310**		**400**	J-	**120**	J-
Phenanthrene	41	5.3	U	5.1	U	0.044	J	5	U	0.21		0.24		5	U	5.1	R	5	R
Pesticides	µg/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dieldrin	0.038	**0.066**	J	**1**	R	**1**	R	**0.048**	J	**0.062**	J	**0.056**	J	**0.063**	J	**0.062**	J	0.016	J
Dioxins/Furans	pg/L	pg/L		pg/L		pg/L		pg/L		pg/L		pg/L		pg/L		pg/L		pg/L	
2,3,7,8-TCDD	0.03	**0.71**	U	**0.71**	U	**0.71**	U	**0.98**	U	**0.97**	U	**1.1**	U	**0.95**	U	**0.76**	U	**0.75**	U
TEQ (Mammal)	30000	2.8		0.47		0.045		18		10		2.8		0.19		0.78		1.9	

Notes:

mg/L - Milligrams per Liter

µg/L - Micrograms per Liter

pg/L - Picograms per Liter

J - Estimated Value

U - Not Detected Above Laboratory Quantitation Limit

R - Value is considered unusable due to exceedance of technical quality control criteria.

TEQ - Toxicity Equivalent Quotient

Highlight indicates a result that exceeds the Remediation Goal for groundwater.

Table 1.B
FEBRUARY/MARCH 2022 PACKER TESTING ANALYTICAL RESULTS
HAVERTOWN PCP SUPERFUND SITE
HAVERTOWN, PENNSYLVANIA

Sample ID's	Remediation	CW-37D-30-50		CW-37D-43-55		CW-37D-90-102		CW-37D-190-200		CW-37D-210-220		CW-38D-38-58		CW-38D-75-95		CW-39D-41-53		CW-39D-53-65	
Date Sampled	Goal for	3/1/2022		3/2/2022		3/2/2022		3/3/2022		3/3/2022		3/15/2022		3/15/2022		2/22/2022		2/22/2022	
Depth (ft bgs)	Groundwater	30 - 50		43 - 55		90 - 102		190 - 200		210 - 220		38 - 58		75 - 95		41 -53		53 - 65	
Analyte		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Semivolatiles	µg/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
2-Methylnaphthalene	2	0.044	J	0.059	J	0.029	J	0.3		0.031	J	0.092	J	0.0096	J	1.5	J	5	U
4,6-Dinitro-2-methylphenol	1.7	10	R	10	U	10	U	10	U	10	UJ	10	R	10	R	10	U	10	U
Benzo(a)pyrene	0.2	0.1	R	0.1	U	0.1	U	0.1	U	0.1	UJ	0.1	R	0.1	R	5	U	5	U
bis(2-ethylhexyl)phthalate	6	5	R	5	U	5	U	5	U	5	UJ	5	R	5	R	5	U	5	U
Dibenzofuran	4	5	R	5	U	5	U	5	U	5	UJ	5	R	5	R	5	U	5	U
Naphthalene	3	1	J	0.3	J+	0.15	J+	1.6		0.18	J	0.47	J-	0.026	J	**6.1**		**3.6**	J
Pentachlorophenol	1	**87**	J	**44**		**36**		**94**		**73**	J	**72**	J	0.84	J-	**90**		**63**	
Phenanthrene	41	0.17	J-	0.17		0.1		0.44		0.18	J	0.085	J	0.016	J	1.9	J	1.4	J
Pesticides	µg/L	ug/L						ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dieldrin	0.038	**0.1**	UJ	**0.1**	UJ	**0.1**	UJ	**0.1**	U	**0.1**	U	**0.2**		**0.18**		**0.096**	U	**0.1**	R
Dioxins/Furans	pg/L	pg/L		pg/L		pg/L		pg/L		pg/L		pg/L		pg/L		pg/L		pg/L	
2,3,7,8-TCDD	0.03	**0.74**	U	**0.69**	U	**0.69**	U	**1.8**	J	**0.69**	U	**0.75**	U	**0.71**	U	**0.7**	U	**0.71**	U
TEQ (Mammal)	30000	0.2		0.18		0.11		39		0.31		0.13		0.16		2.9		1.2	

Notes:

mg/L - Milligrams per Liter

µg/L - Micrograms per Liter

pg/L - Picograms per Liter

J - Estimated Value

U - Not Detected Above Laboratory Quantitatic

R - Value is considered unusable due to excee

TEQ - Toxicity Equivalent Quotient

Highlight indicat

Table 1.B
FEBRUARY/MARCH 2022 PACKER TESTING ANALYTICAL RESULTS
HAVERTOWN PCP SUPERFUND SITE
HAVERTOWN, PENNSYLVANIA

Sample ID's	Remediation	CW-39D-68-80		CW-39D-95-107		CW-39D-131-143		CW-39D-145-155		CW-39D-192-202		CW-39D-237-247		CW-39D-248-300		CW-41D-55-70		CW-41D-75-87	
Date Sampled	Goal for	2/23/2022		2/23/2022		2/23/2022		2/23/2022		2/24/2022		2/25/2022		2/28/2022		2/9/2022		2/9/2022	
Depth (ft bgs)	Groundwater	68 - 80		95 - 107		131 - 143		145 - 155		192 - 202		237 - 247		248 - 300		55 - 70		75 - 87	
Analyte		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Semivolatiles	µg/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
2-Methylnaphthalene	2	0.42		0.14		0.91		0.041	J	0.38	J-	0.1	U	0.22		5	U	5	U
4,6-Dinitro-2-methylphenol	1.7	10	U	10	U	10	U	10	R	10	R	10	U	10	U	10	U	10	U
Benzo(a)pyrene	0.2	0.1	U	0.1	U	0.1	U	0.1	R	0.1	R	0.1	U	0.1	U	5	U	5	U
bis(2-ethylhexyl)phthalate	6	5	U	5	U	5	U	5	R	5	R	5	U	5	U	5	U	5	U
Dibenzofuran	4	5	U	5	U	5	U	5	R	5	R	5	U	5	U	1	J	1	J
Naphthalene	3	2.4		0.89	J+	**4.6**		0.6	J-	**3.2**	J-	0.021	J	1.5		1.4	J	2.1	J
Pentachlorophenol	1	**76**		**22**		**130**		**110**	J-	**95**	J-	**81**		**74**		**180**		**180**	
Phenanthrene	41	1		0.48		2		0.16	J-	0.54	J-	0.1	U	0.17		5	U	5	U
Pesticides	µg/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dieldrin	0.038	**0.1**	R	**0.1**	R	**0.1**	R	**0.097**	R	0.0018	J	0.0015	J	**0.097**	R	**0.098**	U	**0.097**	U
Dioxins/Furans	pg/L	pg/L		pg/L		pg/L		pg/L		pg/L		pg/L		pg/L		pg/L		pg/L	
2,3,7,8-TCDD	0.03	**0.73**	U	**0.71**	U	**0.73**	U	**0.79**	U	**0.74**	U	**0.74**	U	**0.7**	U	**1**	U	**0.95**	U
TEQ (Mammal)	30000	1.1		0.14		2.9		0.0051		7.8		13		7.3		1.7		6.9	

Notes:
mg/L - Milligrams per Liter
µg/L - Micrograms per Liter
pg/L - Picograms per Liter
J - Estimated Value
U - Not Detected Above Laboratory Quantitatic
R - Value is considered unusable due to excee
TEQ - Toxicity Equivalent Quotient
Highlight indicat

Table 1.B
FEBRUARY/MARCH 2022 PACKER TESTING ANALYTICAL RESULTS
HAVERTOWN PCP SUPERFUND SITE
HAVERTOWN, PENNSYLVANIA

Sample ID's	Remediation	CW-41D-113-125		CW-41D-125-137	
Date Sampled	Goal for	2/9/2022		2/10/2022	
Depth (ft bgs)	Groundwater	113 - 125		125 - 137	
Analyte		Result		Result	
Semivolatiles	**µg/L**	**ug/L**		**ug/L**	
2-Methylnaphthalene	2	**20**		**6600**	
4,6-Dinitro-2-methylphenol	1.7	10	U	100	U
Benzo(a)pyrene	0.2	5	U	**12**	J
bis(2-ethylhexyl)phthalate	6	5	U	50	U
Dibenzofuran	4	1.5	J	**270**	
Naphthalene	3	**130**		**12000**	
Pentachlorophenol	1	**560**		**16000**	
Phenanthrene	41	1.9	J	**4200**	
Pesticides	**µg/L**	**ug/L**		**ug/L**	
Dieldrin	0.038	**0.097**	U	**0.198**	UJ
Dioxins/Furans	**pg/L**	**pg/L**		**pg/L**	
2,3,7,8-TCDD	0.03	**0.94**	U	**25**	J
TEQ (Mammal)	30000	180		**130000**	

Notes:
mg/L - Milligrams per Liter
µg/L - Micrograms per Liter
pg/L - Picograms per Liter
J - Estimated Value
U - Not Detected Above Laboratory Quantitatic
R - Value is considered unusable due to excee
TEQ - Toxicity Equivalent Quotient
Highlight indicat

Table 1.C – Average Pump Test Results

Havertown October 2022 Pump Test Flow Rates

The flow rates for wells CW-36D, CW-37D, CW-39D, and CW-41D are found in the table below

Well ID	Min Flow Rate (gpm)	Interval Hour of Min Flow Rate (after start of test)	Max Flow Rate (gpm)	Interval Hour Max Flow Rate (after start of test)	Average Flow Rate (gpm)
CW-36D	8.33	18:00	11.30	02:00	8.80
CW-37D	13.32	11:00	13.66	22:00	13.50
CW-39D	13.80	06:00	14.07	07:00	13.91
CW-41D	10.80	03:00	14.17	21:00	12.90

The average flow rate over the 24-hr test period for all four wells was 12.28 gpm.

Interval hours 02:00 to 24:00 were used to determine minimum, maximum, and average flow rates.

APPENDIX C

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Appendix C – ARARs and TBCs
Havertown PCP Superfund Site, Haverford Township, Delaware County, PA
Engineering Evaluation/Cost Analysis (EE/CA)

Applicable or Relevant and Appropriate Requirements (ARARs)[1]

Requirement	Citations	Status	Description	Relation to Removal
Pennsylvania (PA) Water Quality Standards promulgated under Sections 5(b)(1) and 402 of the Clean Streams Law, Act of June 22, 1937, P.L. 1987, as amended ("Clean Streams Law"), 35 P.S. §§ 691.5(b)(1) and 691.402; and Section 304 of the Clean Water Act of 1972, as amended ("CWA"), 33 U.S.C. § 1314	25 Pa. Code §§ 93.7 and 93.8a	Relevant and appropriate Chemical-specific	These are the specific water quality criteria established under Section 304 of the Clean Water Act. These provisions set the concentrations of pollutants that are allowable at levels that preserve aquatic life and human health, based on water and fish ingestion. Ambient water quality criteria may be relevant and appropriate to CERCLA cleanups based on uses of a water body.	These criteria are currently being met by the TGTS (Alternative ("Alt." 2)). Design of the groundwater treatment plant (GWTP) that would be constructed under Alt. 3 would ensure that discharges of treated groundwater to Naylor's Run meet the criteria established for protection of aquatic life.
Guidelines promulgated under the PA Clean Streams Law for development of water quality criteria	25 Pa. Code §§ 16.1, 16.24, 16.31-16.33, 16.41, 16.51, and 16.101-102	Applicable Action-specific	These regulations specify guidelines and procedures for development of water quality criteria for toxic substances. Water quality criteria are the numeric concentrations, levels, or surface water conditions that need to be maintained or attained to protect existing and designated uses. They are designed to protect the water uses listed in 25 Pa. Code Chapter 93 (relating to water quality standards).	These criteria are currently being met by the TGTS (Alt. 2). Design of the GWTP under Alt. 3 would ensure that discharges of treated groundwater to Naylor's Run meet the criteria for toxic substances that need to be maintained to protect existing and designated uses of Naylor's Run.
Regulations implementing the National Pollutant Discharge Elimination System (NPDES) under Sections 318, 402, and	40 CFR §§ 122.2, 122.4. 122.5, 122.21, 122.26. 122.29, 122.41, 122.43 - 122.45, 122.47, and 122.48.[2]	Applicable Action-specific	These regulations establish effluent limits for discharges to waters of the Commonwealth and the United States.	These criteria are currently being met by the TGTS (Alt. 2). Design of the GWTP under Alt. 3 would ensure that discharges of treated

[1] The NTCRA would, to the extent practicable considering the exigencies of the situation, attain ARARs under federal environmental or state environmental or facility-siting laws. *See* 40 C.F.R. § 300.415(j). The NTCRA will contribute to the efficient performance of the long-term remedial action selected in the OU3 ROD. *See* 42 U.S.C. § 9604(a)(2). This EE/CA or any future Action Memorandum for a NTCRA would not alter the ARARs previously identified in the OU3 ROD, which ARARs will be attained during the remedial action. The ARARs identified in this EE/CA will only apply to the NTCRA.
[2] All of these sections, except for 122.47, are incorporated by reference into PA regulations by 25 Pa. Code § 92.2.

Requirement	Citations	Status	Description	Relation to Removal
405 of the CWA, 33 U.S.C. §§ 1328, 1342, and 1345 PA NPDES Requirements	 25 Pa. Code §§ 92.3, 92.7, 92.31, 92.41, 92.51, 92.55, 92.57, 92.73, 93.6, 93.7, 95.2, and 96.6			groundwater comply with the substantive parts of these provisions.[3] No NPDES permit will be obtained.[4]
Stormwater regulation promulgated under the CWA, 33 U.S.C. §§ 1251 et seq.	40 C.F.R. § 122.26(c)(1)(ii)	Relevant and appropriate Action-specific	These regulations require the operator of a new stormwater discharge related to small construction activity to maintain information about the nature of the site, the on-site activities, proposed best management practices to control pollutants in stormwater during and after construction activities, an estimate of the runoff coefficient of the site, and the name(s) of the receiving water(s).	To the extent practicable, best management practices to control stormwater would be implemented during construction of the GWTP under Alt. 3 and recovery wells. Information required to be maintained under this regulation would be reported to appropriate PA and federal officials.
PA requirements for erosion and sediment control promulgated under the Clean Streams Law	25 Pa. Code §§ 102.4(b)(l), 102.11, and 102.22	Applicable Action-specific	These regulations identify erosion-and-sediment-control requirements and criteria for activities involving land-clearing, grading, and other earth disturbances.	To the extent practicable, construction of the GWTP and recovery wells under Alt. 3 would comply with these regulations. Compliance would minimize erosion and sedimentation to Naylor's Run or other surface water during and after the NTCRA.
Standards for Contaminant Emissions, promulgated under the Air	25 Pa. Code §§ 123.1(a) and (c), 123.2, and 123.41	Action-specific Applicable	These regulations prohibit fugitive emissions, fugitive particulate matter emissions, and visible emissions.	To the extent practicable, emissions occurring due to construction or operation of

[3] The term *applicable requirements* means *substantive* requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility-siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. 40 C.F.R. § 300.5.

[4] No federal, state, or local permit is required for the *on-site* portion of a CERCLA response action. 42 U.S.C. § 9621(e). The term *on-site* means the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action. 40 C.F.R. § 300.5; *see also* 40 C.F.R. 300.400(e)(1) (same definition of *on-site*).

Requirement	Citations	Status	Description	Relation to Removal
Pollution Control Act, Act of 1959, P.L. 2119, No. 787, as amended, 35 P.S. §§ 4001 et seq. (ACPA)				the TGTS (Alt. 2) or GWTP (Alt. 3) would be addressed in accordance with these requirements. No permit will be obtained, but all substantive requirements of a permit would be met.
National primary and secondary ambient air quality standards for particulate matter promulgated under Section 109 of the Clean Air Act (CAA), 42 U.S.C. § 7409	40 C.F.R. §§ 50.6 and 50.7	Action-specific Applicable	These regulations establish the national primary and secondary ambient air quality standards for particulate matter in fugitive dust.	These standards are currently being met by the TGTS (Alt. 2). To the extent practicable, emissions occurring due to construction or operation of the GWTP (Alt. 3) would comply with these standards
National Emissions Standards for Hazardous Air Pollutants (NESHAP): Site Remediation, promulgated under Section 112 of the CAA, 42 U.S.C. § 7412	40 C.F.R. Part 63, Subpart GGGGG - - §§ 63.7884-.7887; 63.7890(a)-(b); 63.7891(b); 63.7893(b); 63.7910(a)-(b); 63.7912-.7913; 63.7920; 63.7922; 63.7923(a); 63.7935(a), (g), (h)(1)-(2), (i), (j); 63.7937(b)(1), (c)(1); 63.7938(b), (c)(1)-(3), (d); 63.7941(c), (d), (f), (k); 63.7943(a)-(c); 63.7944 (a)-(c); 63.7945(a); and 63.7946-.7947.	Applicable Action-specific	This subpart of the NESHAP establishes national emissions limitations and Maximum Achievable Control Technology ("MACT") standards for hazardous air pollutants ("HAPs") emitted from site remediation sources. This subpart also establishes requirements to demonstrate initial compliance with the emissions limitations and work practice standards.	Some Site COCs are designated HAPs under the NESHAP. The GWTP that would be constructed under Alt. 3 would be designed to achieve compliance with the substantive provisions of the NESHAP. No permit will be obtained.
	40 C.F.R. § 61.64(b)		This provision sets the standards for emissions of vinyl chloride from air strippers.	It is anticipated that the GWTP constructed under Alt. 3 may include the construction of an oil/water separator building. If dioxins are present above NPDES limits, the GWTP would include UV oxidation, a process that generates chloroform. Therefore, a GWTP may

Requirement	Citations	Status	Description	Relation to Removal
				require an air stripper if dioxins are present.
Regulations concerning water wells promulgated under the PA Water Well Drillers License Act, 32 P.S. § 645.12	17 Pa. Code §§ 47.5 and 47.7	Applicable Action-specific	These regulations require notice to the PA Department of Conservation and Natural Resources (DCNR) when new wells are drilled and maintenance of well records.	To the extent practicable, EPA will coordinate with DEP and DCNR in relation to any new recovery wells that would be drilled at the Site during implementation of Alt. 3.

APPENDIX D

DETAILED COST ESTIMATES

Table 3.A. - Cost Estimate for Implementation of Alternative 2

Line Item	Est. Quantity	Unit	Cost/Unit	Total Est. Cost
Estimated Yearly Costs				**$ 1,657,500**
Annual equipment rental and operation of TGTS	1	YR	$ 1,200,000	$ 1,200,000
Recovery well maintenance	1	YR	$ 140,000	$ 140,000
Monthly utility costs	12	MO	$ 5,000	$ 60,000
Quarterly groundwater monitoring and NPDES compliance confirmation	4	QT	$ 30,000	$ 120,000
Contingency	10%		$ 137,500	$ 137,500

Abbreviated Terms

TGTS -= Temporary Groundwater Treatment System

MO = Month

NPDES= National Pollutant Discharge Elimination System

QT= Quarter

YR= Year

Table 3.B. - Cost Estimate for Implementation of Alternative 3

Line Item	Est. Quantity	Unit	Cost/Unit	Total Est. Cost
Initial Construction of the GWTP				**$ 13,390,006**
Civil	1	LS	$ 410,888	$ 410,888
Structural & architectural	1	LS	$ 2,741,032	$ 2,741,032
Mechanical - HVAC & plumbing	1	LS	$ 361,047	$ 361,047
Process	1	LS	$ 1,255,726	$ 1,255,726
Electrical	1	LS	$ 735,246	$ 735,246
Instrumentation	1	LS	$ 668,907	$ 668,907
Startup, testing, & analytical	1	LS	$ 75,000	$ 75,000
Calgon UV/OX system, shallow air stripper, and H2O2 feed system	1	LS	$ 570,000	$ 570,000
Spare parts, lab testing equipment, routine O&M tools/supplies, PPE	1	LS	$ 30,000	$ 30,000
CCI, GC burdened cost, & sales tax	1	LS	$ 1,856,366	$ 1,856,366
General conditions - construction, administration, mobilization, & temporary faciliti	1	LS	$ 2,468,520	$ 2,468,520
Contingency (10%)	10%		$ 1,117,273	$ 1,117,273
Construction oversight	1	LS	$ 1,100,000	$ 1,100,000
Additional Recovery Wells				**$ 2,900,000**
Well construction - approx. 300' and assumed NAPL	8	EA	$ 100,000	$ 800,000
Forcemain/controls	8	EA	$ 262,500	$ 2,100,000
Post-Construction GWTP Operational Costs (Est. 2 Years)				**$ 3,894,440**
Annual Plant Operation	2	YR	$ 1,610,200	$ 3,220,400
Quarterly groundwater monitoring and NPDES compliance confirmation	8	QT	$ 40,000	$ 320,000
Contingency	10%		$ 165,020	$ 354,040
Total Estimated Yearly Cost		YR	$ 1,815,220	

Capital Costs Total	$ 16,290,006
Grand Total	$ 20,184,446

Abbreviated Terms

GWTP= Groundwater Treatment Plant

LS= Lump Sum

NPDES= National Pollutant Discharge Elimination System

QT= Quarter

YR= Year

GC = General Contractor

NAPL = Non-Aqueous Phase Liquid